ESS validation manual

Energy statistics on quantities & prices

Regulation (EC) 1099/2008

Regulation (EU) 2016/1952

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eurostat

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1. Introduction

Glossary & acronyms

EDAMIS	Electronic Data files Administration and Management Information System (the current implementation of the Single Entry Point concept of Eurostat)
ESS	European Statistical System
ESSC	European Statistical System Committee
ESWG	Energy Statistics Working Group (working group including all countries reporting energy data to Eurostat in the framework of Regulation (EC) No 1099/2008 and Regulation (EU) 2016/1952)
EU	European Union
NSI	National Statistical Institute
ONA	Other National Authority
VIP	Vision Infrastructure Project

Purpose of this document

The validation manual is an essential input for high quality of energy statistics. It is fully in line with the ESS.VIP on validation and the envisaged design of the future ESS wide validation processes. One of the outcomes needed is a transparent and well described set of validation rules. The Members of the ESWG agreed the rules presented in this manual. This document is the 1st official edition of the validation rules. It covers the reporting as defined in Annexes of Regulation (EC) No 1099/2008 on energy statistics and Annexes of Regulation (EU) 2016/1952 on European statistics on natural gas and electricity prices.

Validation of energy statistics is a very complex exercise. It is not be possible to describe all rules in terms of exact mathematical formulas. This document lists only the validation rules on which there is no methodological or conceptual disagreement. In other words, this document includes only a reduced subset of all possible validation rules one can think of. In future the existing rules could be complemented by additional rules.

The objective of a good design of a set of validation rules is:

- to achieve a satisfactory quality of the outcome of the validation process (detection of important errors and relevant warnings);
- to keep the cost of that process under control;
- to enable an efficient validation process (fast execution, low detection of false errors);
- to ensure as much as possible the completeness of the validation (most real errors are detected by the system)
- to achieve confidence of the statisticians in the system.

Designing and maintaining a set of validation rules is a dynamic learning process. It can be improved through the experiences drawn from the work on successive data vintages. A subsequent editions of this document will build on the experiences gathered. This might imply revisions of various thresholds and ranges presented in the validation rules. Moreover, it is expected that additional validation rules will be gradually included and will complement the existing validation rules.

Relationship between validation and quality

The purpose of data validation is to ensure a certain level of quality of the final data. Quality has several dimensions in official statistics: relevance, accuracy, timeliness and punctuality, accessibility and clarity, comparability, coherence, completeness. Hence, it is important to establish which components of quality are being addressed by data validation. Data validation in energy statistics as described in this document covers the quality dimensions related to the 'structure and values of the data', that are accuracy, comparability, coherence and completeness. Data validation as described in this document does not focus on quality aspects from the processes or the scope of data collection itself (relevance, timeliness and punctuality, accessibility and clarity).

ESS.VIP Validation

GENERAL INTRODUCTION TO ESS.VIP VALIDATION

The term validation refers to any process used to establish whether data conform to specific criteria. Broadly speaking, data validation supports all the other steps of the data production process in order to improve the quality of statistical information. Validation systems are designed to check plausibility and coherence of the data and to detect possible errors. This is one of the most complex operations in the life cycle of statistical data.

Validation is a key task performed in all statistical domains. In spite of its prominent role in the statistical business process, validation is not currently covered by common standards and procedures at the level of the ESS. To enforce standards, tools and procedures the ESS.VIP Validation was launched. The objective of the ESS.VIP Validation is to deploy a coherent validation policy in the different statistical domains in cooperation with the reporting countries. The key features of this policy are:

- A methodology or typology of validation rules and types of outcomes;
- For each domain a set of validation rules and tasks along the collection-production chain;
- A formal agreement of the respective working group on those rules and the responsibilities for performing those validations by the reporting countries and by Eurostat;
- The use of a common language (meta-language) for describing consistently and clearly the validation logic;
- The development of IT tools and standards which can be used by reporting countries and Eurostat for performing those validation checks.

This ESS policy of shared validation will increase integration of knowledge and processes between Eurostat and reporting countries and lead to a higher efficiency and effectiveness in validation. This policy will specify a set of validation tasks along the production chain and also their distribution between Eurostat and the reporting countries. One key aspect is the development of a common language for validation rules, and its use, together with common validation tools in the statistical domains. Integration between Eurostat and reporting countries is to be achieved through sharing validation rules in a common validation language and distributing validation responsibilities, ensuring the coherence between data files and the integrity of the data.

Prior to the dissemination of annual energy statistics, Eurostat requires that data validation has been performed at different stages:

- The first stage is at the end of the collection phase and concerns micro data. Validation has to be performed by the reporting countries.
- The second stage concerns the national data sent by the reporting countries to Eurostat. Validation has to be performed by both the reporting countries and Eurostat.
- The third and last stage of validation concerns a higher level of aggregated data. This validation has to be performed by Eurostat.

The key elements for an efficient validation process are:

- Agreed responsibility in validation checks: "Who validates what?" and "How are the detected errors and warnings dealt with?"
- Expressing validation rules in a "universal" validation syntax or language and storing them in a shared repository. This syntax might also be used for documenting and communicating validation rules;
- An efficient service to edit and maintain the validation rules;
- Common tools to perform the validation checks, as well as the transmission of standard outcome reports (errors and warnings).

POLICY BACKGROUND

In 2009, Eurostat issued the "Communication to the European Parliament and the Council on the production method of EU statistics: a vision for the next decade". The main goal is to transform the production of European statistics from a traditional "stove-pipe" approach to an integrated, more flexible model. This means that the ESS should move towards more common solutions and shared services. In order to implement the goal stated in the Communication, the ESS has adopted a set of projects. One of these projects is the ESS.VIP Validation.

In May 2012 the ESSC had endorsed a strategic paper[1] on the general principles and orientation for a review of validation policy in the ESS. The paper proposed to modernise validation in the ESS by setting ambitious medium term goals:

- Ensuring the transparency of the validation procedures applied to the data sent to Eurostat by the ESS Member States through a common validation policy focusing on the attribution of validation responsibilities among the different actors in the production process of European statistics.
- Improving the interoperability between Eurostat and Member States through the sharing and re-use of validation services across the ESS on a voluntary basis.
- A systematic methodological review of the validation process and agreement on the allocation of tasks for different validation levels to either reporting countries or Eurostat to be done by the specific thematic working groups.

FURTHER DEPLOYMENT

In May 2016 the ESSC has further discussed and endorsed the deployment actions[2] of ESS.VIP Validation. The table below shows which deployment actions are mandatory or optional for Member States.

Deployment action	Business Outcomes	Implementation
Agreement and documentation at Working Group level of validation rules and responsibilities	Reduction of costs related to the time consuming validation cycle in the ESS ("validation Ping-Pong")	MANDATORY
	Increase in the quality and credibility of European statistics	
Use of shareable and reusable ESS services to validate data	Reduction of costs related to IT development and maintenance	Optional

The ESSC endorsed the actions proposed for the deployment.

[1] ESSC 2012/13/3/EN (available on CIRCABC: Eurostat > European Statistical System Committee)
[2] ESSC 2016/29/2c/EN (available on CIRCABC: Eurostat > European Statistical System Committee)

DEFINITION OF VALIDATION LEVELS FOR ENERGY STATISTICS

The definition of validation levels is an active and dynamic work area. The generic definitions of validation levels have been adapted to the specific circumstances of the energy domain and the practices related to the energy data collection and their validation. The classification presented in this manual is by no means the only possible one, but it represents the basis for an exchange of views in the domain of energy statistics. The examples provided for each level are not meant to be exhaustive.

Validation level 0

Some quality checks do not need any data (referring to the specific values of either the statistical or the reference variables) in order to be performed. These checks constitute validation level 0. For example, quality checks that only require the structure of the file or the format of the variables as input. Some aspects of validation at level 0 are implicitly met due to the implemented procedures. The energy questionnaires themselves are in the password protected MS Excel files that automatically check entries into cells (only numbers are allowed). The agreed data transmission modalities between the reporting countries and Eurostat.

Before even "reading" the (statistical) content of the data included in the file, one can perform the following checks:

- If the file has been sent/prepared by the authorised authority (data sender);
- If the file has the agreed format (file format);
- If the data points have the required format (format of each variable);
- If the data points have the agreed unit of measurements;
- If all the required information is included in the file (no missing data).

Validation level 1

Validation level 1 groups all quality checks that only need the (statistical) information included in the file itself. Validation level 1 is usually referred to as "intra-dataset checks" or “individual checks”. Since a file can be defined as a specific occurrence of a dataset, these checks should be more properly called "intra-file checks". Some energy questionnaires contain historic time series. In such cases each time period is treated individually. The validation checks are performed only on each single time period independently from other time periods. The consistency checks of these time series and the detection of outliers fall into the scope of validation level 2, even if in some instances all data are present in the file.

These checks can be based at different elements within a file:

- At the level of one data point;
- At the level of two or more data points (up to all the records of the entire file).

Validation level 2

Validation level 2 groups all the quality checks whereby the content of the file is compared with the content of "other files" referring to the same statistical domain (in this case, the energy domain) and the same country. The consistency checks of time series, and the detection of outliers, fall into this category of validation.

"Other files" could refer to:

- Other versions of exactly the same file (including revisions);
- Other files which contain related data points linked by a logical or mathematical relationship, especially files referring to other time periods;
- Other datasets for the same or similar phenomenon but referring to the same or other correlated time periods (e.g. cumulative monthly vs. annual data).

While the distinction between level 2 and level 3 depends on the source of the "other files", in the energy domain the source is the country transmitting the data, even if the actual organisations responsible for data transmission within one country are different.

Thus, Validation level 2 is defined as "intra-domain intra-country checks" – meaning the cross checking and the cross validation of all files received from one country. These checks are also known as "inter-questionnaire checks".

Validation level 3

Validation level 3 is defined as "intra-domain inter-country checks". This means that the plausibility and consistency checks within the same domain are available in the same data-compiling institution, but the data are transmitted by different countries. For example, in the case of trade mirroring checks, whereby the imports reported by one country have to correspond to the exports reported by the respective trading partner within a specified period of time. In other words, Validation level 3 has in its scope all energy data transmitted by all countries to Eurostat.

Validation level 4

Validation level 4 is defined as plausibility or consistency checks between separate domains available in the same institution. The availability implies a certain level of "control" over the methodologies by the concerned institution. Checks could also be made between results from correlated micro-data and macro-data sources. Other plausibility checks could be based on known correlations between different phenomena.

Essentially these checks are based on the plausibility of results describing the "same" phenomenon within different statistical domains of Eurostat. One example is energy trade figures in both the energy statistics and the trade statistics. Another example is the correlation between fuel consumption in road transport in the energy statistics and transport activity reported in the transport statistics.

Validation level 5

Validation level 5 is defined as plausibility or consistency checks between the data available in one institution and the data/information available outside this institution. This implies that there is no "control" over the methodology on the basis of which the external data are collected, and sometimes only a limited knowledge of it. Statistical indicators might be compiled by national institutions such as the national statistical institute, ministries or other governmental bodies; by private entities (ports, airports, companies, etc.) and by international organisations (European Central bank, World Bank, International Monetary Fund, United Nations, Organisation for Economic Co-operation and Development, etc.) for their own needs. Validation level 5 would thus mean comparing data transmitted to Eurostat with other data available to various institutions that are obtained using different methodologies independently.

Validation of energy statistics

Eurostat performs a set of validations of the energy statistics transmitted by the reporting countries. These consist of individual consistency checks, time series checks, specific checks between one or more energy questionnaires and checks of various calculated indicators (for example the efficiency of transformation processes). Once a complete set of energy questionnaires for a given country is received, a set of validation checks is performed on the level of energy balance.

Eurostat focuses mostly on validation levels 1 and 2. In recent years Eurostat started to focus also on validation level 3. In addition Eurostat also started some trials for validation at level 4 and level 5. In general systematic validation at levels 4 and 5 were not yet developed and tested for energy statistics in the ESS. There are some general practices that apply to all statistical domains. In this respect, Eurostat prepared and disseminated the Practical Guide to Data Validation in Eurostat.

Error correction policy on transmitted data files

Error correction is an activity aimed at detecting and correcting data that do not correspond to predefined correctness criteria (reporting instructions and validation rules). In general this activity goes beyond the actual numerical values in the data transmissions and among other aspects includes also validation level 0. For data transmissions under the framework of Regulation (EC) No 1099/2008 on energy statistics and Regulation (EU) 2016/1952 on European statistics on natural gas and electricity prices, Eurostat will never do any error correction in the received data transmissions. It is the responsibility of national authorities (NSI or ONA) to ensure that corrected data are transmitted to Eurostat upon notification of possible discrepancies detected during data validation.

Data editing policy

Data editing is an activity aimed at detecting and correcting logical inconsistencies in data. Data editing in the energy domain is strictly limited to activities related to the production of energy balances. For example this includes inserting missing calorific values or replacing obviously erroneous values detected as "Errors" during data validation. This is limited only to the essential elements for presenting data for individual fuels in energy units and for compilation of consistent energy balances.

Note for Eurostat's of energy balances

Every entity compiling energy balances has to make certain methodological choices for the creation and presentation of energy balances, taking into account the known limitation of available data. The methodological choices made by Eurostat for the compilation of energy balances shall not be considered as error correction or data editing of received data transmissions.

Acknowledgements and information sources

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Several documents published by Eurostat, draft documents available only as internal version, presentations, websites and other information sources of Eurostat where analysed when preparing this document. Some sections of this document are copied from other already elsewhere available documents or documents currently under preparation. The most important references include:

- Methodology for data validation 1.0 – Revised edition June 2016 – Essnet Validat Foundation
- Practical Guide to Data Validation in Eurostat
- ESSC and ESWG meeting documents
- Towards a Common Validation Policy - An ESS.VIP project for mutual benefits
- Statistical data editing & validation - Eurostat Info Space

2. Processing stages and their outcome

Processing stages

Looking from the perspective of Eurostat's internal process, validations can be done at several stages of the data treatment process:

- **A**: at the arrival time at the Single Entry Point for data
  This is currently implemented by EDAMIS.
- **B**: before transferring to an internal production database
  This is implemented by IT services of Eurostat: EDIT, STRUVAL and CONVAL
- **C**: in the internal production database as individual data transmission
  This will be implemented in Oracle database with local interface (MDT)
- **D**: when the full set of data transmissions from one country is available
- **E**: at the time when indicators and energy balances are constructed
- **F**: at the time when transmissions from all countries are available
- **G**: when energy related indicators are constructed
- **H**: when undertaking ad-hoc actions on specific validation at levels 4 and 5

The tables below present the links between the validation levels and processing stages, reflecting on the desired stage of implementation in Eurostat – from the validation level perspective as well as from the processing stage perspective:

Validation level	Processing stage
0	A & B & C
1	B & C & D
2	C & D & E & G
3	F & G
4	G & H
5	H

Processing stage	Validation level
A	0
B	0 & 1
C	0 & 1 & 2
D	1 & 2
E	2
F	3
G	2 & 3 & 4
H	4 & 5

Validation outcome

Data validation is a decisional procedure ending with an acceptance or refusal of data. The decisional procedure is generally based on rules expressing the acceptable combination of values. Rules are applied to transmitted data. If data satisfy the rules, which means that the combination expressed by the rules is not violated, data are considered valid for the final use they are intended to. There is of course also the possibility of using the complementary approach in which rules are expressed in “negative form”: in this case data are validated by verifying that predefined non-acceptable combinations of values do not occur.

Data validation assesses the plausibility of data: a positive outcome will not guarantee that the data is correct, but a negative outcome will guarantee that the data is incorrect (not accurate and/or not coherent) or that the data needs to be further investigated.

This following text describes possible validation outcomes and general consequences of these outcomes. In principle, there are 3 possible validation outcomes: OK, Warning and Error.

It is important to note that “Warning” and “Error” do not prevent data transmissions from being executed and completed. Data transmissions showing errors from validation on levels 0, 1 and 2 are assessed as non-compliant with quality criteria.

In the subsequent chapters of this manual, for each validation rule it is specified if its negative outcome results in a WARNING or in an ERROR.

OK

This means that the transmitted data passed the validation rule and no specific follow up is required. At this stage of validation, no further explanations are expected to be provided (for example in the Remarks sheet of the questionnaire). However, as the automatic validation is complemented by human validation, it might be possible that questions will be asked during a later stage of the validation process.

In general, validation rules that have “OK result” are not listed in the validation report.

WARNING OR INFO

These mean that some reported element is “suspicious”. It might refer to an individual data point, combination of data points or calculations based on reported data points. It highlights an issue of attention and for which a valid explanation might exist. It does not mean that the data is not coherent or that a new data transmission is required. It merely indicates an element of special attention. The actual situation of the data production units or the eventual estimations in data reporting (performed by either the production entities or by statisticians in the process of compiling the national data) could easily explain and clarify the reported values. Countries can accelerate the validation procedures by providing comments and explanations addressing these warnings or infos in the Remarks sheet of the questionnaire.

As the automatic validation is complemented by human validation, it might be possible that "WARNING" or “INFO” questions will be asked during a later stage of the validation process.

ERROR

This means that a serious issue related to coherency, consistency and/or plausibility was detected in transmitted data. In the vast majority of cases this would mean that a correction needs to be provided in the form of a new data transmission. Errors in validation at level 0 will imply a refusal of the data transmission and consequently the need of a new transmission. For validation levels 1, 2 and 3 the transmission will be accepted by Eurostat's Single Entry Point for data transmissions.

As the automatic validation is complemented by human validation, it is very likely that "ERROR" questions will be asked during a later stage of the validation process.

If an error at validation level 1 and 2 is not corrected by the national authority and an updated questionnaire is not transmitted to Eurostat, it might result in the need for an arbitrary choice to be made by Eurostat during compilation of energy balances.

Error detection convention

The standard established in the European Statistical System for data indicate: *Data with no errors shall be transmitted before the deadline*. Compliance with Regulation (EC) No 1099/2008 on energy statistics implies according to this standard:

- Sending of the data before the legal deadlines;
- The transmitted data should have no errors, major gaps and inconsistencies.

The second point clearly needs to be formalised. The proposal of an error convention is the answer. In order to clearly differentiate what is included in the error conventions and what is not included, for each validation rules in this manual there is the following indication:

Inclusion in error convention: YES/NO

Validation of small values – rounding issues

When dealing with small numbers, the errors due to rounding can be significant. Even in cases when the correct reporting principles are applied the resulting figures can exhibit "suspicious behaviour". The table below shows an example of such behaviour.

	Real value	Rounded 1 decimal	Rounded 0 decimal
Numerator	1.249	1.2	1
Denominator	2.551	2.6	3
Ratio	**49%**	**46%**	**33%**

Therefore, if by changing the reported value by the smallest reporting unit dramatically changes the result of a calculated indicator, the resulting outcome "error" or "warning" shall be considered as fragment of rounding and not the real validation "error" or "warning".

The consideration for validation of small values is in general applicable to all validation rules. Nevertheless, the rule applies only for indicators that exhibit such rounding behaviour. For elements where reporting consistency is required (elements that have to be equal), there is no exemption for validation of small numbers.

3. Validation of data transmissions

This chapter describes validation at level 0. As this validation does not actually verify the real energy data of the file, it is described only once. It applies in exactly the same way for all data transmissions. In other words, it applies to the following datasets in EDAMIS:

Annual energy statistics:

- ENERGY_ELECT_A (annual questionnaire for electricity & heat)
- ENERGY_ESH_A (annual questionnaire for energy statistics in households)
- ENERGY_NTGAS_A (annual questionnaire for natural gas)
- ENERGY_NUCLEAR_A (questionnaire for annual nuclear statistics)
- ENERGY_PETRO_A (annual questionnaire for oil)
- ENERGY_RENEW_A (annual questionnaire for renewables & waste)
- ENERGY_SOLID_A (annual questionnaire for solid fossil fuels and manufactured gases)

Monthly energy statistics:

- ENERGY_ELEC3_M (monthly questionnaire for electricity)
- ENERGY_ MOSGAS_M (monthly questionnaire for natural gas)
- ENERGY_ MOSOIL_M (monthly questionnaire for oil)
- ENERGY_SOLID_M (monthly questionnaire for coal)

European statistics on natural gas and electricity prices:

- ENERGY_PRELH_S (Electricity prices for household customers)
- ENERGY_PRELI_S (Electricity prices for non-household customers)
- ENERGY_PRGAH_S (Natural gas prices for household customers)
- ENERGY_PRGAI_S (Natural gas prices for non-household customers)

Annex:

- ENERGY_SHARES_A (SHort Assessment of Renewable Energy Sources)

This chapter is very important for the process since all data transmitted to Eurostat have an official legal status. For EU Member States, these data transmissions are used for assessing legal compliance with the legislative framework of the European Union. Consequently validation of transmission modalities is necessary.

Data transmission modalities

These validation rules relate to the entity of the sender of the data transmission and the information accompanying the transmitted file (transmission metadata).

1) Transmission authority & other metadata

Validation type: **ERROR – BLOCKING: transmission will not be accepted**

Inclusion in error convention: YES

Validation level: 0

Processing stage: A

Only the officially designated national authorities may transmit the file via EDAMIS to Eurostat.

Eurostat maintains the list of National Statistical Institutes and Other National Authorities that are authorised to perform official data transmissions in the ESS. Changes in the national responsible authorities need to be formally communicated to Eurostat and the corresponding administrative information and rights need to be updated in the EDAMIS system before any data transmission to Eurostat may be executed.

Given that non-authorised persons cannot perform such data transmissions in EDAMIS, the validation of the sender (the correct national entity) is implicit in the use of Eurostat's data transmission system. However, if due to unavailability of the EDAMIS system, data transmission needs to be performed by other electronic means (for example by email), the verification on the sender must be performed manually. So, this type of error is only possible when data were not transmitted via EDAMIS.

2) Country, year and dataset

Validation type: **ERROR – BLOCKING: transmission will not be accepted**

Inclusion in error convention: YES – might require manual detection

Validation level: 0-1

Processing stage: A-B-C

Each transmission in EDAMIS includes metadata such as the time period and the dataset code name. This implies that the selection of these metadata when initiating the data transmission has to correspond to the selection made in the questionnaire transmitted.

For each questionnaire there is a dataset defined in EDAMIS. The correspondence between EDAMIS dataset and the file transmitted is checked, for example a coal questionnaire cannot be transmitted as a dataset for natural gas questionnaire.

The year selected in EDAMIS for data transmission has to correspond to the reference year of the questionnaire, for example the annual questionnaire for reference year 2018 cannot be transmitted with year 2017 selected.

The annual energy questionnaires are country specific – each questionnaire contains a country name. This country name has to correspond to the country transmitting the file.

3) Confidential values

Validation type: **ERROR – BLOCKING: transmission will not be accepted**

Inclusion in error convention: YES – might require manual detection

Validation level: 1

Processing stage: B-C

Transmission of confidential values is specific for each EDAMIS dataset. Only questionnaires corresponding to datasets stored in a more secure environment with restricted access can contain confidential data points. Specific transmission modalities for confidential values were communicated to all reporting countries by Eurostat during the ESWG meetings. The comments on the "Remarks" sheet or in the accompanying message with data transmission are analysed for information that might indicate inclusion of confidential data. For questionnaires where reporting flags is possible, this can be automatized.

The transmission of confidential values is not allowed in the following datasets:

- ENERGY_ELECT_A (annual questionnaire for electricity & heat)
- ENERGY_ESH_A (annual questionnaire for energy statistics in households)

- ENERGY_NTGAS_A (annual questionnaire for natural gas)
- ENERGY_NUCLEAR_A (questionnaire for annual nuclear statistics)
- ENERGY_PETRO_A (annual questionnaire for oil)
- ENERGY_RENEW_A (annual questionnaire for renewables & waste)
- ENERGY_SOLID_A (annual questionnaire for solid fossil fuels and manufactured gases)
- ENERGY_ELEC3_M (monthly questionnaire for electricity)
- ENERGY_ MOSGAS_M (monthly questionnaire for natural gas)
- ENERGY_ MOSOIL_M (monthly questionnaire for oil)
- ENERGY_SOLID_M (monthly questionnaire for coal)
- ENERGY_SHARES_A (SHort Assessment of Renewable Energy Sources)

File format and its structure

For several of the annual energy questionnaires, a pre-filled version with historic time series is sent to the reporting countries. All countries are expected to use these versions of the questionnaires for filling in their new data as well as any revision of previously reported values. Also, Eurostat has empty reporting templates available on its website. Moreover Eurostat has communicated the transmission modalities to reporting countries during its ESWG meetings.

4) File format

Validation type: **ERROR – BLOCKING: transmission will not be accepted**

Inclusion in error convention: YES – might require manual detection

Validation level: 0-1

Processing stage: B-C

The file format of the transmitted questionnaire has to correspond to the agreed format for the dataset. This validation is to check if the file format of the transmitted file is correct and was not altered during data production. The received file must follow the agreed format of the MS Excel questionnaire with no alteration to its structure. This could happen if the option "Save as" is used with a different MS Excel standard from the one agreed for the annual questionnaires.

The sheets in the MS Excel questionnaire cannot be altered (such as rows or columns inserted in the sheets). This is normally not possible as the MS Excel questionnaire is password protected. However, if for some reason a sheet is missing or the name of a sheet is altered, the file will not be eligible for data treatment or loading and will therefore be rejected.

There should be no internal error (MS Excel error message) in any cell of the MS Excel file: circular reference, “#REF!”, “#NAME?”, “#VALUE!”, “DIV/0!” and similar. These errors happen when unsuitable operations are performed within the MS Excel file.

At this stage, the file format is checked to confirm that it is in the appropriate applicable format for the current cycle and that it is not in an obsolete format from previous data collection cycles. For revision of historic time periods the latest version of the annual energy questionnaires has to be used and not the version applicable at the time to which the revisions refer.

5) No obvious data gaps

Validation type: **WARNING or INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B-C

The transmitted questionnaire should be complete and there should be no obvious gaps in the data tables and/or cells. The elements of the questionnaire, which are expected to be completed, should be filled with data values. At this stage, data values themselves are not yet evaluated – only a high level overview of the transmitted questionnaire is performed.

6) Links to external files

Validation type: **ERROR – BLOCKING: transmission will not be accepted**

Inclusion in error convention: YES – might require manual detection

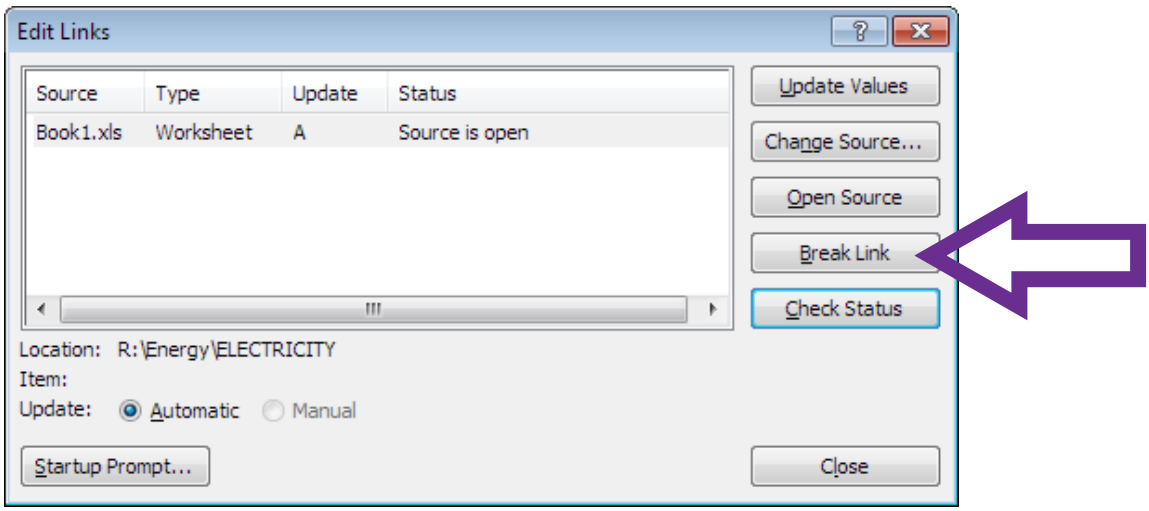
Validation level: 1

Processing stage: C

The transmitted questionnaire may not contain any links to external data sources (usually other MS Excel files). The reason is that the resulting value stored in the Eurostat database could under some conditions be different than the value intended to be transmitted by the reporting country.

All reporting countries have to use the MS Excel function "Break Link" before transmitting a file that contains any link to an external file as shown in Figure 1.

Figure 1: Screenshot from MS Excel version 2010



4. General validation aspects

This chapter describes several aspects and principles of validation topics applicable to all energy data collections. The rules are applicable only for elements that actually exist in individual data collections. For example, reporting combinations of flags and values is not possible in certain MS Excel questionnaires.

7) Consistency of time series

Validation type: **WARNING or INFO**

Inclusion in error convention: NO

Validation level: 1-2-3-4-5

Processing stage: C-D-E-F-G-H

During the validation process, Eurostat analyses the time series and reports any significant distortion detected in the series, i.e. if there is any sudden drop or increase in the values of a series which might indicate erroneous or misplaced data. This includes identification of possible outliers or gaps in the data series. Interpretation of outliers and/or gaps requires specific knowledge about the country, the product type and the flow in question.

The fundamental nature of different flows results in diverse approaches to time series checks. There are certain data series where even a 10% increase/decrease from the previous year can be highly suspicious (for example: diesel consumption in road transport or electricity consumption in households). There are other series that suddenly start/ stop and where big annual variation is observed (for example: import by country of origin).

For example, for natural gas prices for household consumers, there is a significant seasonable fluctuation in several European countries. Therefore a comparison between consecutive semesters is less relevant than comparing with the same semester of previous year.Consequently, the rules cannot be generic for all series and flows with values of very small magnitude require special attention. In case these checks are to be automatized in the future, there is a need to establish categories of time series and carefully set a specific threshold for each of these categories.

Detection of outliers is a specific subset of the analysis of the consistency of the time series. Outliers are observations that do not follow the majority/expected pattern of the data. Such observations need to be systematically and consistently double checked as they might distort the overall energy picture. The detection of outliers should not only be based on the expert's judgement but should also be based on a statistical method. Hence, the detection can be also partly automatized. Once an outlier is detected, regardless of the method of detection, the reporting country should either confirm data transmitted or provide corrections (new transmission).

Other important aspects of time series consistency are breaks in time series. These are usually caused by changes in a national methodology for data collection or data compilation. When breaks in series are detected, the reporting country is requested to provide explanations. Following any change in methodology, it is highly preferable that reporting countries update the historic time series as far back as possible.

8) Plausibility

Validation type: **WARNING or INFO**

Inclusion in error convention: NO

Validation level: 1-2-3-4-5

Processing stage: C-D-E-F-G-H

The reported data in the annual energy questionnaires are expected to be plausible. This includes analysis of energy flows as presented in the questionnaire and comparing it in a wider context with known developments in the energy sector. For example: significant growth of renewable energy sources is to be expected in many European countries as a direct result of recent policy initiatives; decreasing nuclear electricity production can be expected for countries that announced closure of nuclear power plants; fluctuation of intermittent sources of renewable energy according to weather conditions; energy consumption links to economic cycle and weather patterns; limits and technical improvements in energy transformation processes (efficiencies); information on maintenance, closure and accidents of major energy producers and consumers; etc.

The plausibility of each fuel source (e.g. crude oil, lignite, biogasoline) has its specific meaning vis-à-vis the respective flow in the questionnaire. Among other aspects, there should be no significant use of energy products in the sectors outside of their expected use. It is not expected to see crude oil consumption in households (residential sector), as under normal circumstances households use secondary oil products (fuel oil, gas/diesel oil). In a similar manner, it is not expected to see significant quantities of coal products consumed in the transports sector in Europe – the current market practice is to use petroleum products, liquid biofuels and electricity.

The overall plausibility of the questionnaire is difficult to describe precisely. While the data might be entered correctly with no technical/arithmetic errors, these data might apparently be contradicting known facts about the energy sector or related events. These checks cannot be performed in an automatic way. Their efficacy and usefulness depends on the knowledge and experience of energy experts involved in the validation process. It has to be acknowledged that the plausibility checks represent the most challenging part of the work for statisticians inputting the data as well as for those validating it.

9) Formulas in locked cells

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B-C

The MS Excel questionnaires are password protected and several cells include formulas (mostly totals – sums). All these various totals have to be respected and reported correctly, even if cells are not locked and able to be edited. However in case of not available or confidential values, different rules might apply.

10) Data revisions

Validation type: **WARNING or INFO**

Inclusion in error convention: NO

Validation level: 2

Processing stage: C

Nearly all reporting countries provide revisions (transmission of new values replacing values transmitted before). As stated in the ESS Code of Practice, revisions are indicated as a sub-concept to measuring accuracy and reliability of data: Revisions are regularly analysed in order to improve statistical processes. The revision policy for energy statistics, approved during the ESWG meeting in October 2015, provides an input to the overall revision analysis done by Eurostat.

Therefore, Eurostat analyses the values that have been revised. Depending on the magnitude of the revision, in terms of number of data points revised as well as the magnitude of changes in values, there might be a need for detailed explanation and clarification of the revision (unless already provided in the framework of the revision policy).

11) Statistical difference

Validation type: **WARNING or INFO**

Inclusion in error convention: NO

Validation level: 1-2

Processing stage: B-C-E

Each annual energy questionnaire also contains an element indicating the degree of difference between data from the supply side and data from the consumption side: the statistical difference. In many cases, the statistical difference can be used as an indicator to assess or look deeper in accuracy and coherence. Therefore, Eurostat looks at the evolution and the magnitude of statistical difference in reported data and in the energy balance.

It is totally normal to have a statistical difference in the transmitted data. From a statistical perspective a difference is to be expected given that the data would be normally compiled from different sources. Actually, when the statistical difference systematically equals zero, the element of discrepancy is often hidden elsewhere as a consequence of deployed correction mechanisms (which could be questioned). In fact, a small statistical difference might indicate a more robust and more accurate system of data collections than a zero statistical difference. However, methodologies have to be evaluated on an individual level.

The ratio of statistical difference to total supply is calculated for each individual fuel. In general, if this ratio is higher than 5%, there is a need for explanations on national circumstances or practices. In addition Eurostat might request further information on planned national actions to review and improve data methodologies and data collection. For products having a negligible importance in the national energy system, the required threshold that would trigger questions and requests for explanations may be set higher than 5%. For energy products with a very high share in the national energy mix, the 5% statistical difference can also be considered as not desirable, requiring explanations and subsequent information on planned national actions to improve accuracy.

The statistical difference in an energy balance might be calculated differently than the statistical difference in the annual energy questionnaires. The statistical difference in the energy balance is checked for its magnitude and, if it is significant, it will be investigated in detail.

In general, the same rules apply when checking the statistical difference as in the annual energy questionnaires, i.e. the statistical difference should be low with respect to the supply. This is especially important for products that are significant in the national energy mix. Eurostat considers a fuel as energy significant, if its supply (production or gross inland consumption or transformation output) is more than 5% of the total gross inland energy consumption of a country. Thus if the statistical difference is more than 5% of the supply of an energy significant fuel, Eurostat cannot consider this as high accuracy of energy statistics vis-à-vis the quality criteria defined in Article 6 of Regulation (EC) No 1099/2008 on energy statistics.

High statistical differences can also be the consequence of the calorific values applied for conversion from physical units for quantities (tonnes, m3) to units of energy balances (TJ, ktoe). Especially for solid fossil fuels reported in the coal questionnaire, where a coherent set of calorific values should be presented in Table 4. If these values are not coherent, significant statistical differences can occur.

12) Self-trade

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

A country cannot report trade with itself (so, the country of origin for import cannot be the declaring country and similar for country of destination) – the reporting rules under any trade circumstance require trade to be a cross-border trade.

13) Unknown origin for trade

Validation type: **WARNING or INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The quantity reported in category "Not elsewhere specified" should be in general less than 5% of total for imports or exports (in detailed data of reporting imports and exports by country).

14) Stock changes

Validation type: **WARNING or INFO**

Inclusion in error convention: NO

Validation level: 1-2

Processing stage: C

The most important aspect of reporting stock changes is that there should be no unrealistic stock build or stock draw over long time periods. Unless there is a specific explanation for the particular national circumstances, it is expected that the sum of stock changes over a long period of time (such as starting from 1990 till the most recent period) will be relatively small when compared to annual levels of production, trade, supply and/or consumption (depending on the commodity and its use).

15) Data observation status (Flag) mismatch

Validation type: **ERROR**

Validation stage and level: B-1

There are certain rules on combinations of reported elements in the cells of the MS Excel questionnaire. The list below summarises these rules.

- If Flag is set to O "missing value" then the cells for value have to be empty – this means with no value entered, not even a value 0 (zero).
- If Flag is set to N "not significant" then the cells for value have to be entered with a value 0 (zero).
- If Flag is set to E, U or D (estimated, low reliability or definition differs) then the cells for value cannot be empty, a value has to be entered – any value, including 0 (zero) that represents the actual price or tax in the context of the respective Flag.

16) Data observation status (Flag) and data confidentiality status (Conf) mismatch

Validation type: **ERROR**

Validation stage and level: B-1

There are certain rules on combinations of reported elements in the cells of the MS Excel questionnaire. The list below summarises these rules.

- If Conf is set to C, then the cells for value and Flag have to be empty.
- If Flag is set to O "missing value" then the cells for value have to be empty – this means with no value entered, not even a value 0 (zero).
- If Flag is set to N "not significant" then the cells for value have to be entered with a value 0 (zero).
- If Flag is set to E, U or D (estimated, low reliability or definition differs) then the cells for value cannot be empty, a value has to be entered – any value, including 0 (zero) that represents the actual production of electricity in the context of the respective Flag.

17) Missing data observation status (Flag) and data confidentiality status (Conf)

Validation type: **WARNING or INFO**

Validation stage and level: B-1

Eurostat interprets all empty cells combinations (no value, no flag, no confidentiality status) as normal observation of non-confidential value zero. However, in order to ensure that there are no inadvertently empty cells recognised and interpreted as observation with value zero, a warning will be produced for such identified combinations.

5. ENERGY_ELECT_A

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_ELECT_A: the annual energy questionnaire for electricity & heat. The reporting obligation corresponds to chapter 3 in Annex B of Regulation (EC) No 1099/2008 on energy statistics (excluding subchapter 3.4 Data on nuclear energy).

ELECT_A_01 - Gross electricity production - main activity producers electricity

ELECT_A_02 - Gross electricity production - main activity producers CHP

ELECT_A_03 - Gross electricity production - autoproducers electricity

ELECT_A_04 - Gross electricity production - autoproducers CHP

ELECT_A_05 - Gross heat production - main activity producers heat

ELECT_A_06 - Gross heat production - main activity producers CHP

ELECT_A_07 - Gross heat production – autoproducers heat

ELECT_A_08 - Gross heat production - autoproducers CHP

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Gross production has to be equal or greater than net production. This applies to electricity production as well as heat production.

Gross production of electricity reported in Table 1 (sheet GELE) from all producers (main activity and autoproducers) has to be equal or greater than the Net electricity production reported in Table 2 (sheet NELE).

Gross production of Heat reported in Table 1 (sheet GHEAT) from all producers (main activity producers and autoproducers) has to be equal or greater than the Net heat production reported in Table 2 (sheet NHEAT).

Electricity & Heat: Table 1		**Electricity & Heat: Table 2**
GELE, GHEAT		**NELE, NHEAT**
Gross production	≥	Net production
applicable to main activity producers and autoproducers for electricity plants, CHP plants and heat plants for all fuel categories		

ELECT_A_09 - Total gross production of electricity

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total gross production of electricity reported in Table 1 (sheet GELE) from all producers has to be equal to the total gross electricity production reported in Table 3 (sheet ELET34).

Electricity & Heat: Table 1		Electricity & Heat: Table 3
GELE		sheet ELET34
Production		Production
TOTAL Main activity producers + Autoproducer	=	Total gross production

ELECT_A_10 - Total net production of electricity

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total net production of electricity reported in Table 1 (sheet NELE) from all producers has to be equal to the total net electricity production reported in Table 3 (sheet ELET34).

Electricity & Heat: Table 1		Electricity & Heat: Table 3
NELE		sheet ELET34
Production		Production
TOTAL Main activity producers + Autoproducer	=	Total net production

ELECT_A_11 - Total gross production of heat

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Gross production of Heat reported in Table 1 (sheet GHEAT) from all producers has to be equal to the Total gross heat production reported in Table 3 (sheet HEAT34).

Electricity & Heat: Table 1		Electricity & Heat: Table 3
GHEAT		sheet HEAT34
Production		Production
TOTAL Main activity producers + Autoproducer	=	Total gross production

ELECT_A_12 - Total net production of heat

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total net production of Heat reported in Table 1 (sheet GHEAT) from all producers has to be equal to the Total net heat production reported in Table 3 (sheet HEAT34).

Electricity & Heat: Table 1		Electricity & Heat: Table 3
NHEAT		**sheet HEAT34**
Production		**Production**
TOTAL Main activity producers + Autoproducer	=	Total net production

ELECT_A_13 - Total gross electricity production from pumped hydro

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Gross production of Electricity reported in Table 1 (sheet GELE) from Pumped hydro has to be lower than the sum of values Used for pumped storage in pure hydro pumping plants and Used for pumped storage in mixed plants reported in Table 3 (sheet ELET34).

Electricity & Heat: Table 1		Electricity & Heat: Table 3
GELE		**ELET34**
TOTAL Main activity producers + Autoproducer	<	Used for pumped storage in pure hydro pumping plants + Used for pumped storage in mixed plants
Pumped hydro		Electricity

ELECT_A_14 - Hydro pumped storage - gross

ELECT_A_15 - Hydro pumped storage - net

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Hydro electricity production from pumped storage reported in Table 1 and in Table 2 (sheets GELE and NELE) for all producers (main activity and autoproducers) has to be equal or lower than the Hydro electricity production reported in the same tables.

Electricity & Heat: Table 1 and Electricity & Heat: Table 2		
GELE, NELE		
Pumped hydro	≤	Hydro

ELECT_A_16 - Coherence of imports in balance table and trade table - electricity

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Electricity Imports reported in Table 3 (sheet ELET34) are compared with total electricity imports reported in Table 8 (sheet TAB8IMPE).

Electricity & Heat: Table 3		Electricity & Heat: Table 8
ELET34		**TAB8IMPE**
Total imports (balance)	=	TOTAL - IMPORTS

ELECT_A_17 - Coherence of imports in balance table and trade table – heat

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Heat Imports reported in Table 3 (sheet HEAT34) are compared with total heat imports reported in Table 8 (sheet TAB8IMPHC).

Electricity & Heat: Table 3		Electricity & Heat: Table 8
HEAT34		**TAB8IMPHC**
Total imports (balance)	=	TOTAL - IMPORTS

ELECT_A_18 - Coherence of exports in balance table and trade table – heat

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Electricity Exports reported in Table 3 (sheet ELET34) are compared with Total electricity exports reported in Table 8 (sheet TAB8EXPE).

Electricity & Heat: Table 3		Electricity & Heat: Table 8
ELET34		**TAB8EXPE**
Total exports (balance)	=	TOTAL - EXPORTS

ELECT_A_19 - Coherence of exports in balance table and trade table - heat

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Heat Exports reported in Table 3 (sheet HEAT34) are compared with Total heat exports reported in Table 8 (sheetTAB8EXPHC).

Electricity & Heat: Table 3		Electricity & Heat: Table 8
HEAT34		**TAB8EXPHC**
Total exports (balance)	=	TOTAL - EXPORTS

ELECT_A_20 - Electricity production by autoproducer plants - autoproducer electricity

ELECT_A_21 - Electricity production by autoproducer plants - autoproducer CHP

ELECT_A_22 - Electricity production by autoproducer plants - autoproducer total

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total net electricity production by autoproducer electricity and CHP reported in Table 5 (sheets TAB5ELE, TAB5CHP and TAB5TOT) has to be equal to the total net electricity production by autoproducer reported in Table 2 (sheet NELE).

Electricity & Heat: Table 5 Net electricity production		Electricity & Heat: Table 2
TAB5ELE, TAB5CHP, TAB5TOT		**NELE**
ELECTRICITY	=	Autoproducer electricity
CHP	=	Autoproducer CHP
TOTAL	=	Total
Total net production		Electricity

ELECT_A_23 - Capacity for combustible fuels - main activity producers

ELECT_A_24 - Capacity for combustible fuels - autoproducers

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total capacity for combustible fuels reported in Table 7a (sheets TAB7MAIN and TAB7AUTO) has also to be equal to sum of capacities by type of generation reported in the same table, for both main activity and autoproducer.

Electricity & Heat: Table 7a		Electricity & Heat: Table 7a
TAB7AUTO, TAB7MAIN		**TAB7AUTO, TAB7MAIN**
Total capacity – Combustible fuels	=	Steam + Internal combustion + Gas turbine + Combined cycle + Other type of generation
applicable to main activity producers and autoproducers		

Net electricity production vs Net maximum electrical capacity and peak - main activity producers and autoproducers

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Net electricity production by type of generation reported in Table 2 (Sheet NELE) is compared to the corresponding capacities reported in Table 7a (Sheets TAB7MAIN and TAB7AUTO). The load factor of each type of generation has to be below 100%.

Electricity & Heat: Table 2		Electricity & Heat: Table 7a
NELE		**TAB7MAIN + TAB7AUTO**
GWh	≤	$MW_e \times 24 \times 365 / 1000$
Net electricity production		Maximum electrical capacity
applicable to main activity producers and autoproducers		
applicable to: all fuels listed		

Energy gains for heat pumps

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Gross heat production reported in Table 1 (sheet GHEAT) is compared to the use of electricity for heat pumps reported in Table 3 (sheet ELET34). The amount of heat produced has to be higher than electricity input into the heat pump.

Electricity & Heat: Table 1		Electricity & Heat: Table 3
GHEAT		ELET34
Heat pumps: Total main activity producers + Heat pumps: Total Autoproducer plants	>	Used for heat pumps
TJ / 3.6		GWh

Efficiency of electric boilers

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Gross heat production reported in Table 1 (sheet GHEAT) is compared to the use of electricity for electric boilers reported in Table 3 (sheet ELET34). This efficiency of electric boilers has to be lower than 100%.

Electricity & Heat: Table 1		Electricity & Heat: Table 3
GHEAT		ELET34
Electric boilers: Total main activity producers + Electric boilers: Total Autoproducer	<	Used for electric boilers
TJ / 3.6		GWh

Ratio between the gross and net electricity production

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The ratio "net electricity production divided by the gross electricity production" is expected to be in a certain range for each electricity generation technology. If a reported value is outside of the expected range, reporting countries are requested to provide explanations.

Technology	Expected range for ratio of net to gross electricity productions
Nuclear	92 – 98 %
Hydro; Tide, Wave, Ocean; Wind; Solar	95 – 99 %
Combustible fuels; Geothermal; Heat from chemical sources	90 – 96 %
Other sources	90 – 99 %

Electricity used for pumped storage

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The electricity production from Hydro - Pumped hydro reported in Table 1 (sheet GELE) is compared to the use of electricity for pumped storage reported in Table 3 (sheet ELET34) – the sum of values Used for pumped storage in pure hydro pumping plants and Used for pumped storage in mixed plants. The expected ratio between these two values should be between 1.3 and 1.6 (this can be also interpreted as efficiency around 70%).

Electricity & Heat: Table 3		Electricity & Heat: Table 1
ELET34		**GELE**
Used for pumped hydro		Pumped hydro
$1.3 \leq \frac{\text{Electricity used for pumped hydro}}{\text{Electricity production in pumped hydro}} \leq 1.6$		

Electricity production from combustible fuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Gross production of Electricity from combustible fuels, for both main activity producer and autoproducer, reported in Table 1 (sheet GELE) has to be equal to the Total of gross electricity production reported in Table 6d (sheet TAB6TOTAL).

Electricity & Heat: Table 1		Electricity & Heat: Table 6d
GELE		**TAB6TOTAL**
Main activity producer electricity	=	Main activity producer electricity
Main activity producer CHP	=	Main activity producer CHP
Autoproducer electricity	=	Autoproducer electricity
Autoproducer CHP	=	Autoproducer CHP
Combustible fuels		Total all products

Heat production by autoproducer plants (autoproducer heat, CHP, total)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total net heat production by autoproducer heat and CHP reported in Table 5 (sheets TAB5HEAT, TAB5CHPH and TAB5TOTH) has to be equal to the total net heat production by autoproducer reported in Table 2 (sheet NHEAT).

Electricity & Heat: Table 5 Net heat production		**Electricity & Heat: Table 2**
TAB5HEAT, TAB5CHPH, TAB5TOTH		**NHEAT**
CHP	=	Autoproducer CHP
HEAT	=	Autoproducer heat
TOTAL	=	Total Autoproducer
Total net production		Heat

Heat production from combustible fuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Gross production of Heat from combustible fuels, for both main activity producer and autoproducer, reported in Table 1 (sheet GHEAT) has to be equal to the Total of gross heat production reported in Table 6d (sheet TAB6TOTAL).

Electricity & Heat: Table 1		**Electricity & Heat: Table 6d**
GHEAT		**TAB6TOTAL**
Main activity producer CHP	=	Main activity producer CHP
Main activity producer heat	=	Main activity producer heat
Autoproducer CHP	=	Autoproducer CHP
Autoproducer heat	=	Autoproducer heat
Combustible fuels		Total all products

Capacity for combustible fuels

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Total capacity for combustible fuels reported in Table 7a (sheets TAB7MAIN and TAB7AUTO) has to be equal to sum of capacities by single fuel fired and multi-fired plants reported in Table 7b (sheets TAB7MAIN and TAB7AUTO) for both main activity and autoproducer.

Electricity & Heat: Table 7a		Electricity & Heat: Table 7b
TAB7AUTO, TAB7MAIN		TAB7AUTO, TAB7MAIN
Total capacity – Combustible fuels	=	Single fuel fired + Multi-fired solids and liquids + Multi-fired solids and natural gas + Multi-fired liquids and natural gas + Multi-fired solids liquids and natural gas
applicable to main activity producer and autoproducers		

Plausible efficiencies for heat pumps

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The efficiency of heat pumps is expected to be between 200 and 400%.

Electricity & Heat: Table 1		Electricity & Heat: Table 3
GHEAT		ELET34
Heat pumps: Total main activity producers + Heat pumps: Total Autoproducers		Used for heat pumps (GWh*3.6)
$2 \leq \frac{\text{Main activity producers} + \text{Autoprodu cers}}{\text{Used for heat pumps}} \leq 4$		

Efficiencies of electricity and heat generation

The electricity and heat generation reported in Tables 6 is assessed with fuel inputs for electricity generation reported in the same tables. The resulting efficiencies of power generation (electricity and heat for all technologies in all plant types) are summarised for all products on the respective "TAB6" sheets.

Consistent reporting of inputs and outputs

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Both, fuel input and electricity/heat outputs are coherently reported. This means there can be no inputs without outputs nor any outputs without inputs – every output needs its input.

Electricity & Heat: Table 6a, Table 6b, Table 6c, Table 6d		
TAB6×××××		
Fuel input	↔	Elec. prod. Heat prod.
applicable to main activity producers and autoproducers		
applicable to all combustible fuels		

No energy gains for electricity and heat generation

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

There cannot be energy gains in electricity and heat production from combustible fuels. All calculated efficiencies have to be less than 100%.

Electricity & Heat: Table 6a, Table 6b, Table 6c, Table 6d		
TAB6×××××		
(Elec. prod. + Heat prod) / Fuel input	<	1
applicable to main activity producers and autoproducers		
applicable to all combustible fuels		

Plausible efficiencies for electricity and heat generation

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

For each technology category, corresponding to specific fuel, producer type (autoproducer or main activity producer) and technology of production (electricity only heat only, CHP) the efficiencies are expected to be within the indicated range.

Expected range for efficiencies of electricity and heat generation				
%		Electricity only	CHP	Heat only
Anthracite	Main activity producer	32-42	58-87	60-88
	Autoproducer	27-39	49-63	62-81
Coking coal	Main activity producer	31-37	70-83	50-85
	Autoproducer	23-46	38-68	63-100
Other bituminous coal	Main activity producer	33-48	50-78	63-92
	Autoproducer	20-51	44-80	57-86
Sub-bituminous coal	Main activity producer	25-41	50-75	59-88
	Autoproducer	21-31	36-65	49-74
Lignite	Main activity producer	26-42	45-69	57-96
	Autoproducer	22-45	40-83	57-98
Patent fuel	Main activity producer		81-89	43-77
	Autoproducer		64-70	53-79
Coke oven coke	Main activity producer	35-41	54-89	49-99
	Autoproducer	42-47	54-69	56-89
Gas coke	Main activity producer			
	Autoproducer			
Coal tar	Main activity producer		67-95	40-89
	Autoproducer	24-51	56-76	71-100
BKB	Main activity producer	18-34	55-80	67-93
	Autoproducer	9-58	39-66	48-74
Gas works gas	Main activity producer	31-59	69-90	64-95
	Autoproducer	36-65	34-99	66-89
Coke oven gas	Main activity producer	30-48	59-88	65-97
	Autoproducer	24-43	38-75	58-86
Blast furnace gas	Main activity producer	29-50	50-84	44-93
	Autoproducer	22-38	39-71	67-93
Other recovered gases	Main activity producer	32-60	55-82	69-100
	Autoproducer	19-37	45-62	64-97
Peat	Main activity producer	29-47	69-91	61-93
	Autoproducer	26-69	44-75	55-87
Peat products	Main activity producer	49-54	64-75	60-77
	Autoproducer		49-54	55-83
Oil shale and oil sands	Main activity producer	29-39	36-81	34-91
	Autoproducer	37-84	40-95	34-92
Crude oil	Main activity producer			
	Autoproducer		39-70	61-88
NGL (Natural Gas Liquids)	Main activity producer			
	Autoproducer			
Refinery gas	Main activity producer	33-63	55-85	55-95
	Autoproducer	21-52	44-80	65-97
LPG (Liquefied Petroleum Gases)	Main activity producer	31-43	73-87	62-100
	Autoproducer	28-63	41-75	55-86
Naphtha	Main activity producer	27-41	68-82	87-96
	Autoproducer	24-55	65-87	48-100

Expected range for efficiencies of electricity and heat generation				
%		Electricity only	CHP	Heat only
Kerosene type jet fuel	Main activity producer	34-76		76-84
	Autoproducer			
Other kerosene	Main activity producer	17-49		
	Autoproducer		52-76	
Gas/diesel oil	Main activity producer	22-48	51-86	57-94
	Autoproducer	26-58	37-71	60-97
Fuel oil	Main activity producer	25-45	51-84	61-96
	Autoproducer	23-51	40-81	56-97
Bitumen	Main activity producer	37-42	36-44	
	Autoproducer			
Petroleum coke	Main activity producer	34-44	64-83	62-92
	Autoproducer	50-84	45-74	58-64
Other oil products	Main activity producer	26-43	59-89	57-97
	Autoproducer	21-45	48-82	63-88
Natural gas	Main activity producer	32-54	57-92	68-100
	Autoproducer	23-58	49-88	61-96
Industrial waste	Main activity producer	27-48	52-80	62-99
	Autoproducer	22-42	33-74	55-97
Municipal waste (renewable)	Main activity producer	16-35	55-84	57-89
	Autoproducer	14-40	38-66	57-87
Municipal waste (non-renewable)	Main activity producer	16-32	54-81	54-89
	Autoproducer	15-38	40-68	56-84
Solid biofuels	Main activity producer	25-42	51-82	60-93
	Autoproducer	19-48	39-79	53-91
Biogases	Main activity producer	26-51	51-82	57-92
	Autoproducer	24-49	38-75	46-93
Biodiesels	Main activity producer	26-47	41-52	
	Autoproducer	38-42	68-95	
Other liquid biofuels	Main activity producer	34-51	49-75	68-91
	Autoproducer	27-58	47-92	79-87

6. ENERGY_ESH_A

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_ESH_A: the statistics for detailed annual energy consumption in households. The reporting obligation corresponds to the residential split defined in chapter 2.2 of Annex A of Regulation (EC) No 1099/2008 on energy statistics.

Presence of calorific values

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

For certain products (LPG, Other kerosene, and Total gas/diesel oil) or product aggregates (solid fuels, Total oil & petroleum products) where consumption is reported in Table 1 the respective calorific values should be reported. In other words, a declaration of calorific value is mandatory for these products.

Plausibility of calorific values

Validation type: **WARNING**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Calorific values reported are analysed with respect to the expected range for the products concerned. If a reported value is outside of the expected range, reporting countries are requested to provide explanations.

Product	Expected range for average net calorific values (kJ/kg or MJ/t)
Solid fuels	14 000 – 30 000
Total oil & petroleum products	40 000 – 49 000
LPG	43 000 – 49 000
Other kerosene	41 000 – 45 000
Total gas/diesel oil	40 000 – 45 000

Coherence of totals with "Of which" elements

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The sum of reported sub-elements ("Of which" categories of fuels) have to be less or equal to the reported total.

Questionnaire for statistics on energy consumption in households		
all sheets in the questionnaire, where quantities are reported		
Total oil & petroleum products	≥	LPG + Other kerosene + Total gas/diesel oil
Renew. & Wastes	≥	Solar thermal + Solid biofuels excluding charcoal + Biogases

7. ENERGY_NTGAS_A

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_NTGAS_A: the annual energy questionnaire for natural gas. The reporting obligation corresponds to chapter 2 in Annex B of Regulation (EC) No 1099/2008 on energy statistics.

NTGAS_A_01 - Indigenous production (m^3)

NTGAS_A_02 - Indigenous production (TJ)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Indigenous production reported in Table 1 (time series sheet 1_Supply) has to be equal to the sum of associated, non-associated and colliery gas reported in the same table. This applies to data reported in m^3 and also in TJ.

Natural gas: Table 1		
1_Supply		
Indigenous production	=	Associated gas + Non-associated gas + Colliery gas
Million m3 (at 15°C, 760 mm Hg)		
TJ (Gross calor. value)		

NTGAS_A_03 - Inland consumption

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The Inland consumption (Observed) in TJ reported in Table 1 (time series sheet 1_Supply) has to be equal to Inland demand (Total consumption) reported in Table 2a (time series sheet 2a_Consumption).

Natural gas: Table 1		**Natural gas: Table 2a**
1_Supply		**2a_Consumption**
Inland consumption (Observed)	=	Inland demand (Total consumption)
TJ (Gross calor. value)		Terajoules

NTGAS_A_04 - Consistent data presence in Table 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported data for m^3, TJ, GCV and NCV should be consistently present. Either all of them are present for a specific flow (row) or none of them is present. This is not applicable to Gas Vented, Gas Flared and Cushion gas closing stock level.

NTGAS_A_05 - Average GCV

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The gross calorific values reported in Table 1 (time series sheet 1_Supply) have to be in a certain range (±1%) which is defined by the values reported in the same table: million cubic meters and Terajoules. For values of very low magnitudes, errors due to rounding are also accepted

Natural gas: Table 1
1_Supply
$0.99\times\frac{\text{value in TJ}}{\text{value in m3}}\leq\frac{\text{GCV value}}{1000}\leq 1.01\times\frac{\text{value in TJ}}{\text{value in m3}}$
applicable to all flows (rows): Indigenous production, Associated gas, Non-associated gas, Colliery gas, Receipts from other sources, Imports (Balance), Exports (Balance), International marine bunkers, Stock changes (National territory), Inland consumption (Calculated), Inland consumption (Observed), Opening stock level (National territory), Closing stock level (National territory), Opening stock level (Held abroad), Closing stock level (Held abroad) and Memo: Receipts from other sources (Oil, Coal, Renewables)

NTGAS_A_06 - Coherence of imports in balance table and trade table (m³)

NTGAS_A_07 - Coherence of imports in balance table and trade table (TJ)

NTGAS_A_08 - Coherence of exports in balance table and trade table (m³)

NTGAS_A_09 - Coherence of exports in balance table and trade table (TJ)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total imports reported in Table 1 (time series sheet 1_Supply) have to be equal to total imports reported in Table 3 (time series sheet 3i_Imports).

Natural gas: Table 1		**Natural gas: Table 3**
1_Supply		**3i_Imports**
Imports (Balance)	=	Total imports (Trade)
Million m3 (at 15°C, 760 mm Hg)		Million cubic metres
TJ (Gross calor. value)		Terajoules

Natural gas: Table 1		**Natural gas: Table 4**
1_Supply		**4i_Exports**
Exports (Balance)	=	Total exports (Trade)
Million m3 (at 15°C, 760 mm Hg)		Million cubic metres
TJ (Gross calor. value)		Terajoules

NTGAS_A_10 - Imports of LNG (m³)

NTGAS_A_11 - Imports of LNG (TJ)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Imports reported in Table 3 (time series sheet 3i_Imports) have to be higher than imports of which LNG reported in Table 3 (time series sheet 3ii_Imports_OfWhich LNG). This check is applied to each country for which imports are reported.

Natural gas: Table 3		**Natural gas: Table 3**
3i_Imports		**3ii_Imports_OfWhich LNG**
Total imports	≥	of which: LNG
applicable to all countries (rows) and especially the Total imports (Trade) applicable to both **Million m3** and **TJ (GCV)**		

NTGAS_A_12 - Exports of LNG (m³)

NTGAS_A_13 - Exports of LNG (TJ)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Exports reported in Table 4 (time series sheet 4i_Exports) have to be higher than exports of which LNG reported in Table 4 (time series sheet 4ii_Exports_OfWhich LNG). This check is applied to each country for which exports are reported.

Natural gas: Table 4		**Natural gas: Table 4**
4i_Exports		**4ii_Exports_OfWhich LNG**
Total exports	≥	of which: LNG
applicable to all countries (rows) and especially the Total imports (Trade) applicable to both **Million m3** and **TJ (GCV)**		

NTGAS_A_14 - Opening and closing stock levels (m³)

NTGAS_A_15 - Opening and closing stock levels (TJ)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1-2

Processing stage: B-C

Stock changes reported in Table 1 (time series sheet 1_Supply), has to be equal to Opening stock level (National territory) minus Closing stock level (National territory) reported in the same table (the same time series sheet).

Natural gas: Table 1		
1_Supply		
Stock changes (National territory)	=	Opening stock level (National territory) – Closing stock level (National territory)
Million m3 (at 15°C, 760 mm Hg)		
TJ (Gross calor. value)		

Opening and closing stock levels

For a given year, Opening stock reported in Table 1 (time series sheet 1_Supply) has to be equal to the Closing stock of the previous year reported in the same table (the same time series sheet). This applies on both stocks on national territory and stocks held abroad, from 1991 onwards.

Natural gas: Table 1		
1_Supply		
Opening stock level (National territory) for year **Y**	=	Closing stock level (National territory) for year **Y-1**
Opening stock level (Held abroad) for year **Y**	=	Closing stock level (Held abroad) for year **Y-1**
Million m3 (at 15°C, 760 mm Hg)		
TJ (Gross calor. value)		

Average NCV

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Average NCV should be in realistic proportion to GCV, in general 10% lower. However, for Receipts from other sources, the proportion could be different.

8. ENERGY_NUCLEAR_A

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_NUCLEAR_A: the annual nuclear statistics. The reporting obligation corresponds to chapter 3.4 in Annex B of Regulation (EC) No 1099/2008 on energy statistics.

NUCLEAR_A_01 - Production capacities – fresh fuel elements

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of fresh fuel elements is compared with the production capacity of fresh fuel elements. It is not possible to declare higher production than existing production capacity. If production is higher than capacity, the validation result is ERROR and data have to be corrected by the country.

Nuclear questionnaire		Nuclear questionnaire
Production of fresh fuel elements	≤	Production capacity of fresh fuel elements

NUCLEAR_A_02 - Production capacities – Uranium and Plutonium in reprocessing plants

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of Uranium and Plutonium in reprocessing plants is compared with the production capacity of Uranium and Plutonium in reprocessing plants. It is not possible to declare higher production than existing production capacity. If production is higher than capacity, the validation result is ERROR and data have to be corrected by the country.

Nuclear questionnaire		Nuclear questionnaire
Production of Uranium and Plutonium in reprocessing plants	≤	Production capacity of Uranium and Plutonium in reprocessing plants

NUCLEAR_A_03 - Production capacities – MOX fuel elements

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of MOX fuel elements is compared with the production capacity of MOX fuel fabrication plants. It is not possible to declare higher production than existing production capacity. If production is higher than capacity, the validation result is ERROR and data have to be corrected by the country.

Nuclear questionnaire		Nuclear questionnaire
Production of MOX fuel elements	≤	production capacity of MOX fuel fabrication plants

NUCLEAR_A_04 - Annual average burnup of definitively discharged irradiated fuel elements – plausibility lower threshold (below 7)

NUCLEAR_A_05 - Annual average burnup of definitively discharged irradiated fuel elements – plausibility upper threshold (above 55)

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The annual average burnup depends mainly on the technology of the nuclear reactor that is used and for this reason there is a range of plausible values of average burnup. If a significant deviation from the expected range is detected, reporting countries are asked for explanations.

Expected range for annual burnup (GWd/tHM)
7 – 55

9. ENERGY_PETRO_A

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_PETRO_A: the annual energy questionnaire for oil (crude oil and petroleum products). The reporting obligation corresponds to chapter 4 in Annex B of Regulation (EC) No 1099/2008 on energy statistics.

PETRO_A_01 - Receipts from other sources: Memo Items

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Receipts from other sources reported in Table 1 have to be equal to or greater than the sum of the three Memo Items: Receipts from other sources (Solid fuels, Natural Gas and Renewables) reported in the same table. This relationship applies to Additives/oxygenates, Of which Biofuels, Other hydrocarbons and TOTAL.

Oil: Table 1		
Additives-oxygenates, Of which biofuels, Other hydrocarbons, Total - crngfeed		
Receipts from other sources	≥	Solid fuels + Natural Gas + Renewables
Additives/oxygenates, Of which Biofuels, Other hydrocarbons, TOTAL		

PETRO_A_02 - Backflows to refineries 1-2b

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total of Backflows reported in Table 1 (sheet Total - crngfeed) has to be equal to the total of Backflows to refineries reported in Table 2b (sheet Total products).

Oil: Table 1		**Oil: Table 2b**
Total - crngfeed		**Total products**
Backflows	=	Backflows (Backflows to refineries)
TOTAL		TOTAL

PETRO_A_03 - Backflows to refineries 2b-3

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Backflows to refineries reported in Table 2b (sheet Total products) has to be equal to the value reported under Petrochemical plants from Transformation sector in Table 3 (sheet Total products).

Oil: Table 2b		Oil: Table 3
Total products		
Backflows (Backflows to refineries)	=	Petrochemical industry
TOTAL		TOTAL

PETRO_A_04 - Refinery gross output

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Refinery gross output reported in Table 2a (sheet Total products) has to be equal to the difference between Refinery intake observed and Memo items: Refinery losses reported in Table 1 (sheet Total – crngfeed).

Oil: Table 1		Oil: Table 2a
Total - crngfeed		**Total product**
Refinery intake (Observed) – Memo items: Refinery losses	=	Refinery gross output

PETRO_A_05 - Refinery fuel

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Refinery fuel used for Electricity production, CHP production and Heat production reported in Table 2a (all sheets, except Crude oil and NGL) has to be lower or equal to Refinery fuel reported in the same table.

Oil: Table 2a		
Refinery gas, Ethane, LPG, Naphtha, Biogasoline, Non biogasoline, Aviation gasoline, Gasoline type jet fuel, Bio jet kerosene, Non-bio jet kerosene, Other kerosene, Biodiesel, Non-bio gasdiesel oil, Fuel oil - low sulphur, Fuel oil - high sulphur, White spirit SBP, Lubricants, Bitumen, Paraffin wax, Petroleum coke, Other products		
Refinery fuel	≥	Electricity production + CHP production + Heat production
All fuels, except Crude oil and Natural gas liquids		

PETRO_A_06 - Coherence of imports in balance table and trade table

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Imports reported in Table 1 and Table 2a have to be equal to Total imports reported in Table 4.

Oil: Table 1 & Oil: Table 2a		Oil: Table 4
time series for all fuels		
Imports (Balance)	=	Total Imports (Trade)
all products reported in the questionnaire		

PETRO_A_07 - Coherence of exports in balance table and trade table

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Exports reported in Table 1 and Table 2a have to be equal to Total exports reported in Table 5.

Oil: Table 1 & Oil: Table 2a		Oil: Table 5
time series for all fuels		
Exports (Balance)	=	Total Exports (Trade)
all products reported in the questionnaire		

PETRO_A_08 - Stock changes

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Stock changes reported in Table 1 and Table 2a (for all products (except Crude oil and NGL), has to be equal to Opening stock level (National territory) minus Closing stock level (National territory) reported in the same table.

Oil: Table 1 & Oil:Table 2a		
time series for all fuels		
Stock changes	=	Opening stock level (National territory) – Closing stock level (National territory)
all products reported in the questionnaire		

PETRO_A_09 - Interproduct transfers

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The Total of Interproduct transfers reported in Table 2a (sheet Total products) has to be equal to zero.

Oil: Table 2a		
Total products		
Interproduct transfers	=	0
applicable only for TOTAL		

PETRO_A_10 - Products transfer

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total of Products transferred reported in Table 1 (sheet Total – crngfeed) has to be equal to the Total of Products transferred reported in Table 2a (sheet Total products).

Oil: Table 1		Oil: Table 2a
Total - crngfeed		**Total product**
Products transferred	=	Products transferred
TOTAL		TOTAL

PETRO_A_11- Direct use of petroleum products

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The Total of Direct use reported in Table 1 (sheet Total – crngfeed) has to be equal to the Total of Primary product receipts reported in Table 2a (sheet Total products).

Oil: Table 1		Oil: Table 2a
Total - crngfeed		**Total product**
Direct use	=	Primary product receipts
TOTAL		TOTAL

PETRO_A_12 - Direct use of Biofuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Direct use of Biofuels reported in Table 1 (sheet Of which biofuels) has to be equal to the sum of Primary product receipts of Biogasoline, Biodiesels and Bio jet kerosene reported in Table 2a (sheets Biogasoline, Biodiesel and Bio jet kerosene).

Oil: Table 1		**Oil: Table 2a**
Of which biofuels		**Biogasoline, Bio jet kerosene, Biodiesels**
Of which Biofuels	=	Biogasoline + Biodiesels + Bio jet kerosene
Direct use		**Primary product receipts**

PETRO_A_13 - Gross inland deliveries 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Gross inland deliveries calculated in Table 2a (for all products) have to be either positive or equal to zero.

Oil: Table 2a		
time series for all fuels		
Gross Inland Deliveries (Calculated)	≥	0
All fuels in the questionnaire		

PETRO_A_14 - Gross inland deliveries 2

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

For Crude oil and Natural gas liquids, Gross inland deliveries calculated in Table 2a (sheets Crude oil and Natural gas liquids) has to be equal to the observed Gross inland deliveries reported in Table 2a.

Oil: Table 2a		
Crude Oil, Natural gas liquids		
Gross Inland Deliveries (Calculated)	=	Gross Inland Deliveries (Observed)

PETRO_A_15 - Energy/Non-energy use in Petrochemical sector

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total final energy/non-energy consumption in Chemical and petrochemical from Industry sector reported in Table 3 (all products except Refinery feedstocks, Additives-oxygenates, Other hydrocarbons) has to be greater or equal to the sum of Energy use and Non-energy use in petrochemical sector reported in Table 2b (for the same products).

Oil: Table 3		Oil: Table 2b
Crude oil, Natural gas liquids, Refinery gas, Ethane, LPG, Naphtha, Biogasoline, Non biogasoline, Aviation gasoline, Gasoline type jet fuel, Bio jet kerosene, Non-bio jet kerosene, Other kerosene, Biodiesel, Non-bio gasdiesel oil, Fuel oil - low sulphur, Fuel oil - high sulphur, White spirit SBP, Lubricants, Bitumen, Paraffin wax, Petroleum coke, Other products		
Chemical (including petrochemical)	≥	Energy use in the petrochemical industry + Non-energy use in the petrochemical industry
All fuels except Refinery feedstocks, Additives-oxygenates and Other hydrocarbons		

PETRO_A_16 - Non-energy use in Petrochemical sector

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total final non-energy consumption in Chemical and petrochemical from Industry sector reported in Table 3b (All products except Refinery feedstocks, Additives-oxygenates, Of which biofuels, Other hydrocarbons and Total – crngfeed) has to be greater than or equal to Non-energy use in petrochemical sector reported in Table 2b (for the same products).

Oil: Table 3b		Oil: Table 2b
Crude oil, Natural gas liquids, Refinery gas, Ethane, LPG, Naphtha, Biogasoline, Non biogasoline, Aviation gasoline, Gasoline type jet fuel, Bio jet kerosene, Non-bio jet kerosene, Other kerosene, Biodiesel, Non-bio gasdiesel oil, Fuel oil - low sulphur, Fuel oil - high sulphur, White spirit SBP, Lubricants, Bitumen, Paraffin wax, Petroleum coke, Other products		
Chemical (including petrochemical)	≥	Non-energy use in the petrochemical industry
All fuels except Refinery feedstocks, Additives-oxygenates and Other hydrocarbons		

PETRO_A_17 - Gross deliveries of petroleum products 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Gross inland deliveries to petrochemical sector reported in Table 2b (sheet Total products) has to be lower or equal to Total of Gross inland deliveries observed reported in the same table.

Oil: Table 2b		
Total products		
Gross deliveries to the petrochemical industry	≤	Gross inland deliveries (Observed)

PETRO_A_18 - Gross deliveries of petroleum products 2

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Gross inland deliveries to petrochemical sector reported in Table 2b (sheet Total products) has to be equal to the sum of Total of Energy use in petrochemical sector, Total of Non-energy use in petrochemical sector and Total Backflows.

Oil: Table 2b		
Total products		
Gross deliveries to the petrochemical industry	=	Energy use in the petrochemical industry + Non-energy use in the petrochemical industry + Backflows to refineries

PETRO_A_19 - Net deliveries of petroleum products 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Net deliveries of Total products reported in Table 2b (sheet Total products) has to be equal to the difference between Total of Gross inland deliveries observed and Total of Backflows reported in the same table.

Oil: Table 2b		
Total products		
Net deliveries of total products	=	Gross inland deliveries (Observed) - Backflows to refineries

PETRO_A_20 - Net deliveries of petroleum products 2

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Net deliveries to the petrochemical industry reported in Table 2b (sheet Total products) has to be equal to the difference between Total of Gross inland deliveries to petrochemical sector and Total of Backflows reported in the same table.

Oil: Table 2b		
Total products		
Net deliveries to the petrochemical industry	=	Gross deliveries to the petrochemical industry - Backflows to refineries

PETRO_A_21 - Net deliveries of petroleum products 3

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total Net deliveries to the petrochemical industry reported in Table 2b (sheet Total products) has to be lower or equal to Total Net deliveries of Total products reported in the same table.

Oil: Table 2b		
Total products		
Net deliveries to the petrochemical industry	≤	Net deliveries of total products

Additives/Oxygenates and Biofuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Several flows of Additives/Oxygenates reported in Table 1 are compared to the same flows for Biofuels reported in the same table. The quantities declared under Biofuels have to be lower or equal to the quantities reported under Additives/Oxygenates.

Oil: Table 1		Oil: Table 1
Additives-oxygenates		**Of which biofuels**
(22) Receipts from other sources	≥	Receipts from other sources
(23) Memo items: receipts from other sources Solid fuels	≥	Memo items: receipts from other sources Solid fuels
(24) Memo items: receipts from other sources Natural gas	≥	Memo items: receipts from other sources Natural gas
(25) Memo items: receipts from other sources Renewables	≥	Memo items: receipts from other sources Renewables
(26) Direct use	≥	Direct use
(27) Refinery intake (Observed)	≥	Refinery intake (Observed)
(28) Memo items: Refinery losses	≥	Memo items: Refinery losses

Efficiencies of oil refineries

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Refinery gross output of finished products reported in Table 2a is divided by Total Refinery intake observed reported in Table 1 to obtain the efficiency of oil refineries. This efficiency should be between 90% and 100%.

Oil: Table 1		Oil: Table 2a
Total - crngfeed		**Total products**
Refinery intake observed		Refinery gross output
$0.9 \leq \frac{\text{Refinery gross output}}{\text{Refinery intake observed}} \leq 1$		
Applicable only for totals of Table 1 and Table 2a		

Average Calorific Values

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The average calorific values reported in Table 1 and Table 2a are analysed with respect to the expected range for the products in question. If a significant deviation from the expected range is detected, reporting countries are asked for explanations.

Product	Expected range for average net calorific values	
	kJ/kg	
Crude oil	40 000	45 000
Natural gas liquids	41 000	48 000
Refinery feedstocks	39 000	45 000
Additives / oxygenates	35 000	41 000
Of which Biofuels	26 000	40 000
Other hydrocarbons	36 000	43 000
Refinery gas	43 000	51 000
Ethane	45 000	50 000
LPG	43 000	49 000
Naphtha	42 000	47 000
Total motor gasoline	41 000	46 000
Biogasoline	25 000	36 000
Non-biogasoline	42 000	46 000
Aviation gasoline	42 000	46 000
Gasoline type jet fuel	41 000	46 000
Total kerosene type jet fuel	41 000	46 000
Bio jet kerosene	35 000	39 000
Non-bio jet kerosene	41 000	46 000
Other kerosene	41 000	45 000
Total gas/diesel oil	40 000	45 000
Biodiesels	35 000	39 000
Non-bio gas/diesel oil	40 000	45 000
Total fuel oil	38 000	43 000
Fuel oil-low sulphur (< 1%)	38 000	43 000
Fuel oil-high sulphur (>= 1%)	38 000	43 000
White spirit and SBP	40 000	45 000
Lubricants	39 000	43 000
Bitumen	37 000	41 000
Paraffin waxes	37 000	41 000
Petroleum coke	30 000	35 000
Other oil products	37 000	43 000

Presence of calorific values

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

For each fuel that is reported anywhere in the questionnaire, the respective calorific values have to be declared in Table 1 or in Table 2a.

Blended biofuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

All values reported for Total motor gasoline in all main tables (sheet Total motor gasoline) has to be equal to the sum of the values reported for Biogasoline and Non biogasoline in the same tables (sheets Biogasoline and Non biogasoline).

All values reported for Total kerosene type jet fuel in all main tables (sheet Kerosene type jet fuel) has to be equal to the sum of the values reported for Bio jet kerosene and Non-bio jet kerosene in the same tables (sheets Bio jet kerosene and Non-bio jet kerosene).

All values reported for Total gas/diesel oil in all main tables (sheet Gas-Diesel Oil) has to be equal to the sum of Biodiesel and Non-bio gas/diesel oil (sheets Biodiesel and Non-bio gasdiesel oil).

Under normal circumstances, the respective totals of blended fuels are defined in the locked cells of the MS Excel questionnaire and thus implicitly respected and ensured.

Oil: Table 2a & Oil: Table 2b & Oil: Table 3a & Oil: Table 3b & Oil: Table 4 & Oil: Table 5		
Total motor gasoline, Biogasoline, Non biogasoline, Kerosene type jet fuel, Bio jet kerosene, Non-bio jet kerosene, Gas-Diesel Oil, Biodiesel, Non-bio gasdiesel oil		
Total motor gasoline	=	Biogasoline + Non biogasoline
Kerosene type jet fuel	=	Bio jet kerosene + Non-bio jet kerosene
Gas-Diesel Oil	=	Biodiesel + Non-bio gasdiesel oil

Total Fuel oil

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

All values reported for Total fuel oil in all main tables (sheet Total fuel oil) has to be equal to the sum of the values reported for Fuel oil low sulphur and Fuel oil high sulphur in the same tables (sheets Fuel oil - low sulphur and Fuel oil - high sulphur). Under normal circumstances, the respective totals of blended fuels are defined in the locked cells of the MS Excel questionnaire and thus implicitly respected and ensured.

Oil: Table 2a & Oil: Table 2b & Oil: Table 3a & Oil: Table 3b & Oil: Table 4 & Oil: Table 5		
Total fuel oil, Fuel oil - low sulphur, Fuel oil - high sulphur		
Total fuel oil	=	Fuel oil low sulphur + Fuel oil high sulphur

Stock levels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1-2

Processing stage: B-C

For a given year, Opening stock reported in Table 1 or in Table 2a (for all products) has to be equal to the Closing stock of the previous year reported in the same tables. This check applies from 1991 onwards.

Oil: Table 1 & Oil:Table 2a		
time series for all fuels		
Opening stock level (National territory) for year Y	=	Closing stock level (National territory) for year Y-1
all products reported in the questionnaire		

10. ENERGY_RENEW_A

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_RENEW_A: the annual energy questionnaire for renewables & wastes. The reporting obligation corresponds to chapter 5 in Annex B of Regulation (EC) No 1099/2008 on energy statistics.

RENEW_A_01 - Production of Solid biofuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of Solid biofuels excluding charcoal reported in Table 2a (sheet PRIMSBIO) is compared with value reported in Table 4 (sheet SGBIOFUELS). Total production reported in the balance part of the questionnaire (Table 2a - sheet PRIMSBIO) has to be equal to the sum of production for detailed products categories (Table 4 - sheet SGBIOFUELS).

Renewables: Table 2a		Renewables: Table 4
sheet PRIMSBIO		**sheet SGBIOFUELS**
Solid biofuels (excluding charcoal)	=	Fuelwood, wood residues and by-products + Black liquor + Bagasse + Animal waste + Other vegetal materials and residues + Industrial Waste – renewable part
Indigenous production		Production

RENEW_A_02 - Production of Wood pellets

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of Wood pellets reported in Table 4 (sheet SGBIOFUELS) has to be smaller than production of Fuelwood, wood residues and by-products reported in the same table.

Renewables: Table 4		Renewables: Table 4
sheet SGBIOFUELS		**sheet SGBIOFUELS**
Wood pellets	≤	Fuelwood, wood residues and by-products

RENEW_A_03 - Production of Biogases

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of Biogases reported in Table 2a (sheet BIOGASES) is compared with value reported in Table 4 (sheet SGBIOFUELS). Total production reported in the balance part of the questionnaire (Table 2a - sheet BIOGASES) has to be equal to the sum of production for detailed products categories (Table 4 - sheet SGBIOFUELS).

Renewables: Table 2a		Renewables: Table 4
sheet BIOGASES		**sheet SGBIOFUELS**
Biogases	=	Biogases from anaerobic fermentation + Biogases from thermal processes
Indigenous production		Production

RENEW_A_04 - Production of Biogases from anaerobic fermentation

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of Biogases from anaerobic fermentation reported in Table 4 (sheet SGBIOFUELS) has to be equal to the sum of production for detailed products categories (Table 4 - sheet SGBIOFUELS).

Renewables: Table 4		Renewables: Table 4
sheet SGBIOFUELS		**sheet SGBIOFUELS**
Biogases from anaerobic fermentation	=	Landfill gas + Sewage sludge gas + Other biogases from anaerobic fermentation
Indigenous production		Production

RENEW_A_05 - Production capacities – liquid biofuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of liquid biofuels reported in Table 2a is compared with the technical data on the production capacity of operating plants reported in Table 3a. It is not possible to declare higher production than existing production capacity. If combined production total is higher than combined capacity, the validation result is ERROR and data have to be corrected by the country.

Renewables: Table 2a		Renewables: Table 3a
BIOGASOL, BIODIESEL, BIOJETKERO, OBIOLIQ		**TOTCAP**
Indigenous production	≤	Liquid biofuels plants capacity
Biogasoline + Bio jet kerosenes + Biodiesels + Other liquid biofuels		

RENEW_A_06 - Coherence of imports in balance table and trade table

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Imports reported in Table 2a are compared with total imports reported in Table 5. The two values should be equal.

Renewables: Table 2a		Renewables: Table 5
BIOGASOL, BIOETHANOL, BIODIESEL, BIOJETKERO, OBIOLIQ		
Total imports (balance)	=	Total Imports (Trade)
Applicable to the following fuels: Biogasoline, Of which bioethanol, Bio jet kerosenes, Biodiesels, Other liquid biofuels		

RENEW_A_07 - Coherence of exports in balance table and trade table

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Exports reported in Table 2a are compared with Total exports reported in Table 6. The two values should be equal.

Renewables: Table 2a		Renewables: Table 6
BIOGASOL, BIOETHANOL, BIODIESEL, BIOJETKERO, OBIOLIQ		
Total exports (balance)	=	Total Exports (Trade)
Applicable to the following fuels: Biogasoline, Of which bioethanol, Bio jet kerosenes, Biodiesels, Other liquid biofuels		

RENEW_A_08 - Detailed categories for hydro

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

There have to be a corresponding match between the total hydro and the subcategories of the hydro category (Pure hydro, Mixed hydro, Pure pumped storage) in Table 1 and in Table 3a.

Renewables: Table 1 – Electricity production		
ELE		
Hydro	=	Pure hydro + Mixed hydro + Pure pumped storage

RENEW_A_09 - Detailed categories for hydro

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

If electricity production from pumping in mixed plants is individually reported, it cannot be bigger than the total production in mixed hydro.

Renewables: Table 1 – Electricity production		
ELE		
Mixed hydro	≥	of which: pumping

RENEW_A_10 - Detailed categories for hydro

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Reported data are checked also for the capacities, if the sum of all hydro subcategories matches the total hydro category.

Renewables: Table 3a – Net maximum electrical capacity		
TOTCAP		
Hydro	=	Pure hydro + Mixed hydro + Pure pumped storage

RENEW_A_11 - Production capacities – liquid biofuels – Biogasoline

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Production of biogasoline reported in Table 2a is compared with the technical data on the production capacity of operating plants reported in Table 3a. It is not possible to declare higher production than existing production capacity. Due to possible fuel confidentiality issues and fuel classification issues this is only an INFO item in the validation.

Renewables: Table 2a		Renewables: Table 3a
BIOGASOL		TOTCAP
Indigenous production	≤	Liquid biofuels plants capacity

RENEW_A_12 - Production capacities – liquid biofuels – Biodiesels

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Production of biodiesel reported in Table 2a is compared with the technical data on the production capacity of operating plants reported in Table 3a.

Renewables: Table 2a		Renewables: Table 3a
BIODIESEL		**TOTCAP**
Indigenous production	≤	Liquid biofuels plants capacity

RENEW_A_13 - Production capacities – liquid biofuels - Bio jet kerosene

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Production of bio jet kerosene reported in Table 2a is compared with the technical data on the production capacity of operating plants reported in Table 3a.

Renewables: Table 2a		Renewables: Table 3a
BIOJETKERO		**TOTCAP**
Indigenous production	≤	Liquid biofuels plants capacity

RENEW_A_14 - Production capacities – liquid biofuels - Other liquid biofuels

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Production of other liquid biofuels reported in Table 2a is compared with the technical data on the production capacity of operating plants reported in Table 3a.

Renewables: Table 2a		Renewables: Table 3a
OBIOLIQ		**TOTCAP**
Indigenous production	≤	Liquid biofuels plants capacity

Production capacities – utilisation

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The utilisation factor of the existing production capacities should be in reasonable range for given technologies. The utilisation factor is defined as production reported in Table 2a divided by the capacity reported in Table 3a. If the calculated utilisation factor is outside of the expected range, reporting countries are requested to provide explanations.

Technology	Expected range for utilisation factors (%)
Biogasoline	50 – 90
Bio jet kerosenes	50 – 90
Biodiesels	50 – 90
Other liquid biofuels	50 – 90

Presence of calorific values

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

If any liquid biofuels or charcoal are reported in Table 2a, the respective calorific values have to be reported in Table 3a.

Calorific values – plausibility

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Calorific values reported in Table 3a are analysed with respect to the expected range for the products in question. If a reported value is outside of the expected range, reporting countries are requested to provide explanations.

Product	Expected range for average net calorific values (kJ/kg or MJ/t)
Biogasoline	25 000 – 36 000
Bioethanol	25 000 – 29 000
Bio jet kerosene	35 000 – 39 000
Biodiesels	35 000 – 39 000
Other liquid biofuels	25 000 – 39 000
Charcoal	28 000 – 32 000

Electricity generation – utilisation of production capacity

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Production of electricity reported in Table 1 is compared with the technical data on the net maximum electrical capacity reported in Table 3a. The utilisation factor of the existing net maximum electrical capacity should be in expected utilisation rate for each reported technology. If a reported value is outside of the expected range, reporting countries are requested to provide explanations.

Technology	Expected range for utilisation factors (%)
Hydro	20 – 60
Geothermal	20 – 75
Solar photovoltaic	5 – 25
Solar thermal	1 – 40
Tide, wave and ocean	10 – 35
Wind	5 – 45
Industrial waste	15 – 80
Municipal waste	25 – 80
Solid biofuels	20 – 80
Biogases	20 – 80
Biodiesels	10 – 40
Other liquid biofuels	5 – 75

Electricity generation – technical maximum production capacity

Validation type: **INFO**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Production of electricity reported in Table 1 is compared with the technical data on the net maximum electrical capacity reported in Table 3a. It is not possible to declare higher production than allowed by existing production capacity being utilised at maximum extent (24 hours a day every day of a year).

Renewables: Table 1		Renewables: Table 3a
ELE		**TOTCAP**
Total electricity production (Main activity producer + Autoproducer)	≤	Net maximum electrical capacity / 1000
GWh		**MW_e × 24 × 365**

Solar collectors surface

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Solar thermal data reported in Table 1 have to be in correspondence with solar thermal collectors surface reported in Table 3a. The reported surface has to be in certain ratio to the reported energy flows. Naturally, this ratio has also to respect the geographical location of the countries – the potential available quantity of solar irradiation due to average local weather and climate conditions.

11. ENERGY_SOLID_A

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_SOLID_A: the annual energy questionnaire for coal (solid fossil fuels and manufactured gases). The reporting obligation corresponds to chapter 1 in Annex B of Regulation (EC) No 1099/2008 on energy statistics.

SOLID_A_01 - The value of production "From other sources" (was 95)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The value reported as "From other sources" has to be higher or equal to the sum of memo items "From other sources – Oil", "From other sources - Natural gas", "From other sources – Renewables" for all derived fuels reported in the questionnaire. These memo items cannot be reported for primary fuels and the flow "From other sources" has a different meaning for primary fuels: "recovered slurries, middlings and other low-grade coal products, which cannot be classified according to type of coal; this includes coal recovered from waste piles and other waste receptacles." This relationship applies to values presented in Table 1 of the questionnaire as well as to the specific sheets of fuels with full time series.

Coal: Table 1		Coal: Table 1
PatentFuel, Coke_OvenCoke, GasCoke, Coal Tar, BKB, GasWorksGas, CokeOvenGas, BlastFurnaceGas, OtherRecoveredGases, PeatProducts		
From other sources	≥	"From other sources – Oil" + "From other sources - Natural gas" + "From other sources – Renewables"
Applicable to the following fuels: Patent fuel, Coke oven coke, Gas Coke, Coal Tar, BKB, Gas Works Gas, Coke Oven Gas, Blast Furnace Gas, Other Recovered Gases, Peat Products		

SOLID_A_02 - The value of "Of which: Non-energy use - Chemical and petrochemical"

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The value reported under "Of which: Non-energy use - Chemical and petrochemical" has to be equal to or lower than the value reported in the row "Non-energy use Industry/Transformation/Energy".

Coal: Table 1		Coal: Table 1
Anthracite, BituminousCoal, CokingCoal, Sub-bituminousCoal, Lignite, PatentFuel, Coke_OvenCoke, GasCoke, Coal Tar, BKB, GasWorksGas, CokeOvenGas, BlastFurnaceGas, OtherRecoveredGases, Peat, PeatProducts, OilShale&OilSands		
Non-energy use Industry/Transformation/Energy	≥	Of which: Non-energy use - Chemical and petrochemical
All fuels in the questionnaire		

SOLID_A_03 - Coherence of imports in the balance table and in the trade table

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Imports reported in Table 1 "Total imports (balance)" are compared with total imports reported in Table 2 "Total Imports (Trade)".

Coal: Table 1		Coal: Table 2
Anthracite, BituminousCoal, CokingCoal, Sub-bituminousCoal, Lignite, PatentFuel, Coke_OvenCoke, Coal Tar, BKB, Peat, PeatProducts		
Imports (Balance)	=	Total imports (Trade)
Applicable to the following fuels: Anthracite, Coking coal, Other bituminous coal, Sub-bituminous coal, Lignite, Patent fuel, Coke oven coke, Coal tar, BKB, Peat, Peat products		

SOLID_A_04 - Coherence of exports in the balance table and in the trade table

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Exports reported in Table 1 "Total exports (balance)" are compared with Total exports reported in Table 3 "Total Exports (Trade)".

Coal: Table 1		Coal: Table 3
Anthracite, BituminousCoal, CokingCoal, Sub-bituminousCoal, Lignite, PatentFuel, Coke_OvenCoke, Coal Tar, BKB, Peat, PeatProducts		
Exports (Balance)	=	Total exports (Trade)
Applicable to the following fuels: Anthracite, Coking coal, Other bituminous coal, Sub-bituminous coal, Lignite, Patent fuel, Coke oven coke, Coal tar, BKB, Peat, Peat products		

Presence of gross calorific values

Presence of net calorific values

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

For all products and flows combinations reported in Table 1, the respective gross and net calorific values should be reported in Table 4. In other words, for all reported fuel/flow combinations a declaration of calorific value is necessary.

Plausibility of calorific values

Validation type: **INFO**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Calorific values reported in Table 4 are analysed with respect to the expected range for the products in question. If a reported value is outside of the expected range, reporting countries are requested to provide explanations.

Product	Expected range for average gross calorific values (kJ/kg or MJ/t)
Anthracite	24 000 – 30 000
Coking coal	24 000 – 30 000
Other bituminous coal	24 000 – 30 000
Sub-bituminous coal	20 000 – 24 000
Lignite	3 000 – 20 000
Patent fuel	25 000 – 32 000
Coke oven coke	24 000 – 32 000
Gas coke	24 000 – 32 000
Coal tar	30 000 – 44 000
BKB	12 000 – 21 000
Peat	7 000 – 15 000
Peat products	8 000 – 15 000
Oil shale and oil sands	2 500 – 12 000

12. Validating the full annual collection

The previous chapters described the validation of the individual data files (individual transmissions of the questionnaires). This chapter describe the cross validation (relationships) between the various transmitted questionnaires from one country. Several combinations of data points reported in various places are checked for accuracy, comparability and coherence (elements b, f, and g of Article 6(3) in Regulation (EC) No 1099/2008 on energy statistics).

Validation at this stage can be performed only at later moment of time, as it requires availability of all data transmissions from one country.

Consistency of electricity and heat production data

18) Renewables: Table 1 ⇔ Electricity & Heat: Table 1 - electricity and heat production

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The electricity and heat production data reported in Table 1 of the renewables questionnaire is compared with the corresponding data reported in Table 1 of the electricity questionnaire. The data for hydro, wind, geothermal, solar, tide/wave/ocean should be equal in these two questionnaires for electricity plants, CHP plants and heat plants.

There can be a very small rounding error for "Solar" resulting from the sum of 2 elements. Hence, the maximum discrepancy allowed is 1 unit. For all other fuels, there can be no rounding errors – after proper mathematical rounding, the values should perfectly match between the corresponding values indicated.

Renewables: Table 1		Electricity & Heat: Table 1
ELE		**GELE**
Hydro	=	Hydro
Geothermal	=	Geothermal
Solar photovoltaic + Solar thermal	=	Solar
Tide, wave and ocean	=	Tide, wave and ocean
Wind	=	Wind
HEAT		**GHEAT**
Geothermal	=	Geothermal
Solar thermal	=	Solar
applicable to main activity producers and autoproducers for electricity plants, CHP plants and heat plants		

19) Coal: Table 1 ⇔ Electricity and Heat: Table 6a – fuel input

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The fuel input into electricity, CHP and heat plants reported in Table 1 of the coal questionnaire should correspond to the values reported in Table 6a of the electricity and heat questionnaire.

Coal: Table 1		Electricity & Heat: Table 6a
time series for all fuels		
Transformation sector		**Fuel input**
Anthracite	=	ANTHRACITE
Coking coal	=	COKING COAL
Other bituminous coal	=	OTHER BITUMINOUS COAL
Sub-bituminous coal	=	SUB-BITUMINOUS COAL
Lignite	=	LIGNITE
Patent fuel	=	PATENT FUEL
Coke oven coke	=	COKE OVEN COKE
Gas coke	=	GAS COKE
Coal tar	=	COAL TAR
BKB	=	BKB
Gas Works Gas	=	GAS WORKS GAS
Coke Oven Gas	=	COKE OVEN GAS
Blast Furnace Gas	=	BLAST FURNACE GAS
Other Recovered Gases	=	OTHER RECOVERED GASES
Peat	=	PEAT
Peat products	=	PEAT PRODUCTS
Oil shale and oil sands	=	OIL SHALE AND OIL SANDS
applicable to main activity producers and autoproducers for electricity plants, CHP plants and heat plants		

20) Coal: Table 4 ⇔ Electricity and Heat: Table 6a – calorific values

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The net calorific values for "Used in main activity plants" reported in Table 4 in the coal questionnaire are compared to the calculated values reported in the electricity and heat questionnaire in Table 6a (((Fuel input in TJ) / (Fuel input in kilotonnes)) × 1000).

Coal: Table 4		Electricity & Heat: Table 6a
time series for respective fuels		
Net calorific value (Used in main activity plants)	=	Fuel input TJ (NCV) / Fuel input 10^3t × 1000
Applicable to: Anthracite, Coking coal, Other bituminous coal, Sub-bituminous coal, Lignite, Patent fuel, Coke oven coke, Gas coke, Coal tar, BKB, Peat, Peat products and Oil shale and oil sands		
Applicable only to "Main activity producer plants"		

21) Oil: Table 3a ⇔ Electricity & Heat: Table 6b – fuel input – main activity producers

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

For main activity producers, the fuel input into electricity, CHP and heat plants reported in Table 3a of the oil questionnaire should correspond to the values reported in Table 6b of the electricity and heat questionnaire.

Oil: Table 3a		Electricity & Heat: Table 6b
time series for all fuels		
Transformation sector Thousand Metric Tons		**Fuel input** 10^3t
Crude oil	=	Crude oil
Natural gas liquids	=	NGL (Natural Gas Liquids)
Refinery gas	=	Refinery gas
LPG	=	LPG (Liquefied Petroleum Gases)
Naphtha	=	Naphtha
Total kerosene type jet fuel	=	Kerosene type jet fuel
Other kerosene	=	Other kerosene
Total gas/diesel oil	=	Gas/Diesel oil
Total fuel oil	=	Fuel oil
Bitumen	=	Bitumen
Petroleum coke	=	Petroleum coke
Ethane + Total motor gasoline + Aviation gasoline + Gasoline type jet fuel + White spirit and SPB + Lubricants + Paraffin waxes + Other oil products	=	Other oil products
applicable to main activity producers for electricity plants, CHP plants and heat plants		

22) Oil: Table 2a + 3a ⇔ Electricity & Heat: Table 6b – fuel input – autoproducers

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

For autoproducers, the fuel input into electricity, CHP and heat plants reported in Tables 2a and 3a of the oil questionnaire should correspond to the values reported in Table 6b of the electricity and heat questionnaire.

Oil: Table 2a + Oil: Table 3a		**Electricity & Heat: Table 6b**
time series for all fuels		
Transformation sector Thousand Metric Tons		**Fuel input** 10^3t
Crude oil	=	Crude oil
Natural gas liquids	=	NGL (Natural Gas Liquids)
Refinery gas	=	Refinery gas
LPG	=	LPG (Liquefied Petroleum Gases)
Naphtha	=	Naphtha
Total kerosene type jet fuel	=	Kerosene type jet fuel
Other kerosene	=	Other kerosene
Total gas/diesel oil	=	Gas/Diesel oil
Total fuel oil	=	Fuel oil
Bitumen	=	Bitumen
Petroleum coke	=	Petroleum coke
Ethane + Total motor gasoline + Aviation gasoline + Gasoline type jet fuel + White spirit and SPB + Lubricants + Paraffin waxes + Other oil products	=	Other oil products
Oil: Table 2a: MEMO ITEMS: REFINERY FUEL USED FOR + Oil: Table 3a: Transformation sector autoproducers	=	Electricity & Heat: Table 6b autoproducers
applicable to autoproducers for electricity plants, CHP plants and heat plants		

23) Oil: Table 2a ⇔ Electricity & Heat: Table 6b – calorific values

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: D

The average net calorific values reported in Table 2a in the oil questionnaire are compared to the calculated values reported in the electricity and heat questionnaire in Table 6b:
(((Fuel input in TJ) / (Fuel input in kilotonnes)) × 1000).

Oil: Table 2a		Electricity & Heat: Table 6b
time series for respective fuels		
Net calorific value (average)	=	Fuel input TJ (NCV) / Fuel input 10^3t × 1000
Applicable to: Crude oil, Natural gas liquids, Refinery gas, LPG, Naphtha, Kerosene type jet fuel Other kerosene, Gas-Diesel Oil, Total fuel oil, Bitumen, Petroleum coke		
applicable to main activity producers and autoproducers for electricity plants, CHP plants and heat plants		

24) Oil: Table 2a ⇔ Electricity & Heat: Table 6b – calorific values – other oil products

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: D

For “Other oil products”, which in this case in an aggregate of multiple fuels in the electricity questionnaire, the comparison needs to be calculated vis-à-vis the weighted average of all products actually used. The weighted average of net calorific values for Ethane, Total motor gasoline, Aviation gasoline, Gasoline type jet fuel, White spirit and SPB, Lubricants, Paraffin waxes and Other oil products reported in Table 2a in the oil questionnaire are compared to the calculated value for Other oil products reported in the electricity and heat questionnaire in Table 6b:
(((Fuel input in TJ) / (Fuel input in kilotonnes)) × 1000).

25) Natural Gas: Table 2a ⇔ Electricity & Heat: Table 6c - fuel input

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The fuel input into electricity, CHP and heat plants reported in Table 2a of the natural gas questionnaires should correspond to the values reported in Table 6c of the electricity and heat questionnaires questionnaire.

Natural Gas: Table 2a		Electricity & Heat: Table 6c
2a_Consumption		**TAB6NGASTJ**
Natural gas	=	Natural gas
applicable to main activity producers and autoproducers for electricity plants, CHP plants and heat plants		

26) Renewables: Table 2a ⇔ Electricity & Heat: Table 6d - fuel input

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The fuel input into electricity, CHP and heat plants reported in Table 2a of the renewables and wastes questionnaires should correspond to the values reported in Table 6d of the electricity and heat questionnaire.

Renewables: Table 2a		Electricity & Heat: Table 6d
time series on both questionnaires for all fuels listed below		
Transformation sector		**Fuel input**
Industrial waste (non-renewable)	=	Industrial waste
Municipal waste (renewable)	=	Municipal waste (renewable)
Municipal waste (non-renewable)	=	Municipal waste (non-renewable)
Solid biofuels excluding charcoal + Charcoal	=	Solid biofuels
Biogases	=	Biogases
Biodiesels	=	Biodiesels
Biogasoline		Biogasolines
Bio jet kerosenes + Other liquid biofuels	=	Other liquid biofuels
applicable to main activity producers and autoproducers for electricity plants, CHP plants and heat plants		

27) Renewables: Table 1 ⇔ Electricity & Heat: Table 6d - electricity and heat production

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The electricity and heat production from biomass and renewable wastes reported in Table 1 of the renewables and wastes questionnaires should correspond to the values reported in Table 6d of the electricity and heat questionnaire.

Renewables: Table 1		Electricity & Heat: Table 6d
ELE, HEAT		**TAB6INDWTJ, TAB6MSWRTJ, TAB6MSWNRTJ, TAB6SBIOFTJ, TAB6BIOGASTJ, TAB6BIODIETONS, TAB6LIQBIOTONS**
Industrial waste	=	Industrial waste
Municipal waste (renewable)	=	Municipal waste (renewable)
Municipal waste (non-renewable)	=	Municipal waste (non-renewable)
Solid biofuels	=	Solid biofuels
Biogases	=	Biogases
Biodiesels	=	Biodiesels
Biogasolines		Biogasolines
Other liquid biofuels	=	Other liquid biofuels
applicable to main activity producers and autoproducers for electricity plants, CHP plants and heat plants		

28) Renewables: Table 3a ⇔ Electricity & Heat: Table 7a – electrical capacity

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The net maximum capacity reported in Table 3a in the renewables and wastes questionnaire is compared to the values reported in the electricity and heat questionnaire in Table 7a.

Renewables: Table 3		Electricity & Heat: Table 7a
TOTCAP		**TAB7MAIN, TAB7AUTO**
Electrical capacity	=	Main activity producers + Autoproducers
Hydro, Pure hydro (no pumping), Mixed plants, Pure pumped storage, Geothermal, Solar photovoltaic, Solar thermal, “Tide, wave and ocean”, Wind		

Consistency of fuel transfers (transformation and blending)

29) Coal: Table 1 ➔ Oil: Table 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The values "Coal liquefaction plants (Transformation)" reported in Table 1 of the coal questionnaire are compared with the values reported in Table 1 in the oil questionnaire (Memo items: receipts from other sources – Solid fuels).

There can be no gains of physical material, however there might be some additional outputs of gaseous and solid fuels that are not reported in the oil questionnaire.

Coal: Table 1		Oil: Table 1
Anthracite, BituminousCoal, CokingCoal, Sub-bituminousCoal, Lignite, PatentFuel, Coke_OvenCoke, GasCoke, Coal Tar, BKB, Peat, PeatProducts, OilShale&OilSands		**Total - crngfeed**
Coal liquefaction plants (Transformation**)** **sum of all solid fuels**	≥	Memo items: receipts from other sources **Solid fuels** **TOTAL**
gaseous fuels (manufactured gases) are excluded		

30) Oil ➔ Coal: Table 1

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: D

If there are any values are reported in the coal questionnaire, in the "Memo item: From other sources - Oil" the country will be asked about the details on the transformation processes to which this flow corresponds. Respective transformation inputs have to exist in the Oil questionnaire.

31) Coal: Table 1 ➔ Natural gas: Table 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The values "For blended natural gas" reported in Table 1 of the coal questionnaire are compared with the values reported in Table 1 in the natural gas questionnaire (Memo items: receipts from other sources – Coal).

The comparison is straightforward as the reported values in the coal questionnaire are reported in terajoules on the gross calorific value basis "TJ (gross)" and in the Natural gas questionnaire the basis of reporting is exactly the same. This corresponds to blending of manufactured gases in the natural gas grid and **not** "upgrading" of manufactured gases with natural gas.

Coal: Table 1		Natural gas: Table 1
GasWorksGas, CokeOvenGas, BlastFurnaceGas, OtherRecoveredGases,		**1_Supply**
Gas works gas + Coke oven gas + Blast furnace gas + Other recovered gases	=	Natural gas
For blended natural gas		Memo: Receipts from other sources: Coal

32) Natural gas: Table 2a ➔ Coal: Table 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The values "Memo item: From other sources – Natural gas" reported in Table 1 of the coal questionnaire are compared with the values reported in Table 2a in the natural gas questionnaire Gas works (Transformation). This corresponds to "upgrading" of manufactured gases with natural gas and **not** blending of manufactured gases in the natural gas grid.

Natural gas: Table 2a		Coal: Table 1
2a_Consumption		**GasWorksGas**
Natural gas	=	Gas works gas
Gas works (Transformation)		Memo item: From other sources – Natural gas

33) Natural gas: Table 2a ➔ Oil: Table 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The values " Gas-to-liquids (GTL) plants (Transformation)" reported in Table 2a of the natural gas questionnaire are compared with the values reported in Table 1 in the oil questionnaire (Memo item: Receipts from other sources – Natural gas).

The comparison is not straightforward as the reported values in the oil questionnaire are reported in thousands tonnes and in the Natural gas questionnaire the basis of reporting is Terajoules. There can be no energy gains in the transformation process, thus in the energy terms, the values reported in the oil questionnaire have to be the same or lower.

Natural gas: Table 2a		**Oil: Table 1**
2a_Consumption		**GasWorksGas**
Gas-to-liquids (GTL) plants (Transformation)		Memo item: Receipts from other sources – Natural gas
Natural gas **TJ (GCV)**	≥	Additives/oxygenates + Other hydrocarbons **converted to TJ using calorific values**

34) Oil: Table 3a ➔ Natural gas: Table 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The values " Memo item: Receipts from other sources – Oil " reported in Table 1 of the natural gas questionnaire are compared with the values reported in Table 3a in the oil questionnaire (For blended natural gas).

The comparison is not straightforward as the reported values in the oil questionnaire are reported in thousands tonnes and in the Natural gas questionnaire the basis of reporting is Terajoules. There can be no energy gains in the transformation process, thus in the energy terms, the values reported in the natural gas questionnaire have to be the same or lower.

Oil: Table 3a		**Natural gas: Table 1**
all fuels		**1_Supply**
For blended natural gas		Memo item: Receipts from other sources – Oil
sum of all fuels **converted to TJ using calorific values**	≥	Natural gas **TJ (GCV)**

35) Renewables: Table 2a ➔ Coal: Table 1

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: D

If any values are reported in the coal questionnaire, "Memo item: From other sources - From other sources - Renewables " the country will be asked about the details on the transformation processes to which this flow corresponds. Respective transformation inputs have to exist in the Renewables questionnaire.

36) Renewables: Table 2a ➔ Natural gas: Table 1

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: D

The values " Natural gas blending plants " reported in Table 2a of the Renewables & wastes questionnaire are compared with the values reported in Table 1 in the natural gas questionnaire (Memo items: receipts from other sources – Renewables).

The comparison is not straightforward as the reported value in the Renewables questionnaire is reported in terajoules on the **net** calorific value basis "TJ (NCV)" and in the Natural gas questionnaire the basis of reporting is in terajoules on the **gross** calorific value basis "TJ (GCV)". However, as the Table 1 in the Natural gas includes also an average gross calorific value "Average GCV" and an average net calorific value "Average NCV", there is an expected relationship between these values.

There can be no rounding errors – after proper mathematical rounding, the values should perfectly match between the corresponding values indicated. If calorific values are rounded, the respective result will be affected too.

Renewables: Table 2a		Natural gas: Table 1
BIOGASES		**1_Supply**
Biogas TJ (NCV)	=	**Natural gas** TJ (GCV) × Average NCV / Average GCV
Natural gas blending plants		Memo: Receipts from other sources Renewables

37) Renewables: Table 2a ➔ Natural gas: Table 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The validation rule above with discrepancy more than 5%:

$$0.95 \leq \text{Biogas TJ (NCV)} / (\text{Natural gas TJ (GCV)} \times \text{Average NCV} / \text{Average GCV}) \leq 1.05$$

38) Renewables: Table 2a ➔ Oil Table 1

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The values "For blending with Motor gasoline/Diesel/Kerosene" reported in Table 2a of the renewables questionnaire are compared with the values reported in Table 1 in the oil questionnaire (Memo items: receipts from other sources – Renewables).

Renewables: Table 2a		Oil: Table 1
BIOGASOL, BIODIESEL, BIOJETKERO, OBIOLIQ		**Of which biofuels**
Biogasoline + Bio jet kerosenes + Biodiesels + Other liquid biofuels	=	Of which biofuels
For blending with Motor gasoline/Diesel/Kerosene		Memo items: receipts from other sources Renewables

39) Renewables: Table 2a ➔ Oil: Table 2a

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 2

Processing stage: D

The values "For blending with Motor gasoline/Diesel/Kerosene" reported in Table 2a of the renewables & wastes questionnaire are compared with the values reported in Table 2a in the oil questionnaire (Primary product receipts).

Renewables: Table 2a		Oil: Table 2a
BIOGASOL, BIODIESEL, BIOJETKERO		**Biogasoline, Biodiesel, Bio jet kerosene**
For blending with Motor gasoline/Diesel/Kerosene	=	Primary product receipts
Biogasoline		Biogasoline
Bio jet kerosenes		Bio jet kerosenes
Biodiesels		Biodiesels

40) Oil: Table 1 & Table 2 – calorific values ⇔ Renewables: Table 3a

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: D

In case biofuels are blended with fossil fuels, the calorific values reported in the oil questionnaire have to correspond to the renewable questionnaire. The relationship is not straightforward as some quantities of blended liquid fuels might also be imported with different biofuels blended and than those domestically produced. While in theory this can result in different calorific values, in practice there is a good match between questionnaires for the reported calorific values of liquid biofuels. The reported calorific values are analysed and clarification questions might be asked in case of significant discrepancies between the oil questionnaire and the renewable questionnaire.

Efficiency of transformation processes

The key elements of analysis in the complete energy balance are the transformation processes. For many transformation processes, the energy balance is the first setting in which all input and output figures are consistently summarised and can be analysed. While transformation of fuels into electricity and heat can be already analysed in the context of the electricity and heat questionnaire, many other transformation processes cannot be fully analysed in the individual data transmissions (individual annual energy questionnaires).

Several transformation processes have input fuels reported on several questionnaires and output reported only in one questionnaire. The following transformation processes need to be analysed:

- Oil refineries
- Coke ovens
- Blast furnaces
- Gas works
- Patent fuel plants
- Brown coal briquettes production and peat briquettes production
- Gas works
- Coal liquefaction plants
- Liquefaction - Regasification
- Gas-to-liquids plants
- Charcoal production

For each of these transformation processes, all possible inputs are summed together in energy units. This is done for quantities reported in the transformation sector as well as in the energy sector.

Efficiencies can be calculated in various ways:

- taking into account only inputs in the transformation sector;
- in combination with inputs in the energy sector.

Below is an example for the checks of coke ovens (real reported data):

Inputs (ktoe)		**Source**
Transformation sector total	**8 328**	**energy balance**
Coking coal	7 449	Coal questionnaire
Lignite	122	Coal questionnaire
Petroleum coke	756	Oil questionnaire
Energy sector total	**573**	**energy balance**
Coke oven gas	147	Coal questionnaire
Blast furnace gas	400	Coal questionnaire
Electricity	26	Electricity & Heat questionnaire
Outputs (ktoe)		**Source**
Output total	**7 106**	**energy balance**
Coke oven coke	5 632	Coal questionnaire
Coke oven gas	1 474	Coal questionnaire
Efficiencies		
Transformation sector total	85%	7 106 / 8 328 = 0.85
Coke oven coke	68%	5 632 / 8 328 = 0.68
Coke oven gas	18%	1 474 / 8 328 = 0.18
Transformation + Energy sector	**80%**	**7 106 / (8 328 + 573) = 0.80**

If this transformation process is analysed only within the transformation sector of the coal questionnaire – effectively excluding inputs reported in other questionnaires – the resulting efficiency will be 94% { 7 106 / (7 449 + 122) = 0.94 }.

Since national practices might differ in how the split between the energy sector and the transformation sector is established, it is important for cross country comparisons to assess several efficiency values.

41) No energy gains in energy transformation

Validation type: **ERROR if above 105%**

WARNING if between 100% and 105%

Inclusion in error convention: NO

Validation level: 2

Processing stage: E

If the efficiency shown in the last row of the table "Transformation + Energy sector" is above 100%, it indicates energy gains within the system. This is physically not feasible and indicates statistical errors: most likely either missing inputs or overestimated outputs. It is also possible, that calorific values used for conversion between physical units and energy units are inaccurate.

In some energy transformation processes a binding agent might be added – an element that is not reported as fuel in the annual energy questionnaires. In such cases, the overall efficiency could be above 100% - however it has to be noted that this is a statistical artefact due to missing inputs. In such cases, the efficiencies are expected to be only slightly above 100% (for example when patent fuels are produced from hard coal fines with the addition of a binding agent).

42) Reasonable efficiency in energy transformation processes

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: E

The table below presents an overview of typical ranges of the expected calculated efficiencies of energy transformation processes. If a significant deviation from the expected range is detected, reporting countries are asked for explanations.

Process	Expected range of efficiencies
%	
Oil refineries	90 – 100
Coke ovens	70 – 90
Blast furnaces	30 – 50
Patent fuel plants	65 – 85
Brown coal briquettes production and peat briquettes production	70 – 90
Charcoal production	20 – 40
Gas works	60 – 80

Coherence of NUCLEAR_A with other data

43) Efficiency: production of nuclear heat vs generation of electricity and derived heat from nuclear

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: D

The sum of the gross electricity generation from nuclear and the heat production from nuclear reported in Table 1 of the Electricity and Heat annual questionnaire (ENERGY_ELECT_A) is transformed into ktoe and divided by the Production of nuclear heat reported in the nuclear questionnaire (ENERGY_NUCLEAR_A) to obtain the efficiency. This efficiency should be between 30% and 40%. If a significant deviation from the expected range is detected, reporting countries are asked for explanations.

Expected range for nuclear efficiency (%)
30 – 40

Coherence of ESH_A with other data

44) Coherence of reported values

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 2

Processing stage: D

The values for all products reported in the questionnaire for statistics on annual energy consumption in households by type of end-use is compared to data reported for households ('Residential' – sub-category of 'Other sectors') in other transmitted datasets.

ENERGY_ESH_A	
Warning if discrepancy bigger than 1%.	
Electricity, Derived heat	ENERGY_ELECT_A
Gas	ENERGY_NTGAS_A, ENERGY_SOLID_A
Solid fuels	ENERGY_SOLID_A
Total oil & petroleum products, LPG, Other kerosene, Total gas/diesel oil	ENERGY_PETRO_A
Renew. & Wastes, Solar thermal, Solid biofuels excluding charcoal, Biogases	ENERGY_RENEW_A

13. ENERGY_ELEC3_M

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_ELEC3_M: the monthly energy questionnaire for electricity. The reporting obligation corresponds to chapter 2 in Annex C of Regulation (EC) No 1099/2008 on energy statistics.

45) No negative figures

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

All values reported in the monthly electricity questionnaire (values entered into editable cells) must be zero or positive.

VAL_MONTHLY_ELECTRICITY		
Table 1 & Table 2		
Reported value	≥	0
Applicable to Table 1: Nuclear, Conventional thermal, Coal, Oil, Natural gas, Combustible renewables, Other combustible fuels (non-renewable), Hydro, Pure hydro, Mixed hydro Pure pumped storage, Wind, Onshore, Offshore, Solar, Solar photovoltaic, Solar thermal, Geothermal, Other renewable sources, Not specified Applicable to Table 2: Total imports, out of which from EU, Total exports, out of which to EU, Used for pumped storage, Transmission and distribution losses		

46) Total net production

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total net production has to be equal to the sum of all individual sources of production: Nuclear, Conventional thermal, Hydro, Wind, Geothermal, Other renewable sources and Not specified.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Total net production	=	Nuclear + Conventional thermal + Hydro + Wind + Geothermal + Other renewable sources + Not specified
In the MS Excel questionnaire this is implemented as a formula in a locked cell.		

47) Conventional thermal: only values

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported net electricity production under Conventional thermal cannot be smaller than the sum of individual sources of production: Coal, Oil, Natural gas, Combustible renewables and Other combustible fuels (non-renewable).

As some values might be not available or confidential, the exact sum is not required.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Conventional thermal	≥	Coal + Oil + Natural gas + Combustible renewables + Other combustible fuels (non-renewable)
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for total is highlighted in red.		

48) Conventional thermal: in combination with flags

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

In case there is no value missing (Flag = O) or confidential (Conf =C) for Coal, Oil, Natural gas, Combustible renewables and Other combustible fuels (non-renewable) the reported net electricity production under Conventional thermal should be equal to the sum of individual sources of production: Coal, Oil, Natural gas, Combustible renewables and Other combustible fuels (non-renewable).

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Conventional thermal	=	Coal + Oil + Natural gas + Combustible renewables + Other combustible fuels (non-renewable)
If there is no value missing (Flag = O) or confidential (Conf =C) for Coal, Oil, Natural gas, Combustible renewables and Other combustible fuels (non-renewable).		

49) Hydro: only values

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported net electricity production under Hydro cannot be smaller than the sum of individual sources of production: Pure hydro, Mixed hydro and Pure pumped storage.

As some values might be not available or confidential, the exact sum is not required.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Hydro	≥	Pure hydro + Mixed hydro + Pure pumped storage
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for total is highlighted in red.		

50) Hydro: in combination with flags

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

In case there is no value missing (Flag = O) or confidential (Conf =C) for Pure hydro, Mixed hydro and Pure pumped storage the reported net electricity production under Hydro should be equal to the sum of individual sources of production: Pure hydro, Mixed hydro and Pure pumped storage.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Hydro	=	Pure hydro + Mixed hydro + Pure pumped storage
If there is no value missing (Flag = O) or confidential (Conf =C) for Pure hydro, Mixed hydro and Pure pumped storage.		

51) Wind: only values

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported net electricity production under Wind cannot be smaller than the sum of individual sources of production: Onshore and Offshore.

As some values might be not available or confidential, the exact sum is not required.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Wind	≥	Onshore + Offshore
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for total is highlighted in red.		

52) Wind: in combination with flags

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

In case there is no value missing (Flag = O) or confidential (Conf =C) for Onshore and Offshore the reported net electricity production under Wind should be equal to the sum of individual sources of production: Onshore and Offshore.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Wind	=	Onshore + Offshore
If there is no value missing (Flag = O) or confidential (Conf =C) for Onshore and Offshore.		

53) Solar: only values

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported net electricity production under Solar cannot be smaller than the sum of individual sources of production: Solar photovoltaic and Solar thermal.

As some values might be not available or confidential, the exact sum is not required.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Solar	≥	Solar photovoltaic + Solar thermal
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for total is highlighted in red.		

54) Solar: in combination with flags

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

In case there is no value missing (Flag = O) or confidential (Conf =C) for Solar photovoltaic and Solar thermal the reported net electricity production under Solar should be equal to the sum of individual sources of production: Solar photovoltaic and Solar thermal.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 1**
Solar	=	Solar photovoltaic + Solar thermal
If there is no value missing (Flag = O) or confidential (Conf =C) for Solar photovoltaic and Solar thermal		

55) Consistency between Table 1 and Table 2

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total net production in Table 1 and in Table 2 have to be exactly the same.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 2**
Total net production	=	Total net production
In the MS Excel questionnaire this is implemented as a formula in a locked cell.		

56) Total imports

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported Total imports cannot be smaller than the imports from EU.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 2		**Table 2**
Total imports	≥	out of which from EU
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for "out of which from EU" is highlighted in red.		

57) Total exports

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported Total exports cannot be smaller than the exports to EU.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 2		**Table 2**
Total exports	≥	out of which to EU
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for "out of which to EU" is highlighted in red.		

58) Used for pumped storage

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The production of electricity reported in Hydro - Pure pumped storage cannot be bigger than the quantity of electricity reported in Used for pumped storage.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 1		**Table 2**
Pure pumped storage	≤	Used for pumped storage
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for "Used for pumped storage" is highlighted in red.		

59) Efficiency of pumped storage

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

If no electricity production in Mixed hydro plants is reported, the efficiency of Pure pumped storage plants can be checked. The electricity production from Hydro - Pure pumped storage reported in Table 1 is compared to the use of electricity for pumped storage reported in Table 2. The expected ratio between these two values should be between 1.3 and 1.6 (this can be also interpreted as efficiency around 70%).

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 2		**Table 1**
$1.3 \leq \frac{\text{Used for pumped storage}}{\text{Pure pumped storage (net production)}} \leq 1.6$		
This check is applicable only if Mixed hydro = 0		

60) Available for the internal market

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The quantity of electricity available for the internal market cannot be negative.

VAL_MONTHLY_ELECTRICITY		
Table 2		
Total net production + Total imports - Total exports - Used for pumped storage	≥	0

61) Transmission and distribution losses

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

If Transmission and distribution losses are reported, their magnitude vis-à-vis total supply of electricity has to be reasonably low.

As reporting of "Transmission and distribution losses" is not mandatory for Eurostat, this validation rule is only warning to point out possible inconsistency in reported values.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 2		**Table 2**
Transmission and distribution losses	≤	0.15 × (Total net production + Total imports)
This is alternative notation for checking if transmission and distribution losses are less than 15% of the total supply of electricity.		

62) Total consumption: formula

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Total consumption (calculated) have to respect its definition: Total net production + Total imports - Total exports - Used for pumped storage - Transmission and distribution losses.

As reporting of "Transmission and distribution losses" is not mandatory for Eurostat, this validation rule is only warning to point out inconsistency in reported values.

VAL_MONTHLY_ELECTRICITY		VAL_MONTHLY_ELECTRICITY
Table 2		**Table 2**
Total consumption (calculated)	=	Total net production + Total imports - Total exports - Used for pumped storage - Transmission and distribution losses
In the MS Excel questionnaire this is implemented as a formula in a locked cell.		

63) Total consumption: positive value

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Total consumption (calculated) cannot be negative.

As reporting of "Transmission and distribution losses" is not mandatory for Eurostat, this validation rule is only warning to point out inconsistency in reported values.

VAL_MONTHLY_ELECTRICITY		
Table 2		
Total consumption (calculated)	≥	0

14. ENERGY_MOSGAS_M

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_MOSGAS_M: the monthly energy questionnaire for natural gas. The reporting obligation corresponds to chapter 4 in Annex C of Regulation (EC) No 1099/2008 on energy statistics.

64) MOS GAS vs JODI GAS

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 0

Processing stage: B

The current reporting template allows for a choice between reporting "MOS GAS" and "JODI GAS". Eurostat does not accept JODI GAS.

65) Million m3 vs TJ

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

If any value is reported for natural gas in Million m^3 a value has to be reported for natural gas in TJ. This also applies vice-versa: If any value is reported for natural gas in TJ a value has to be reported for natural gas in Million m^3.

66) No negative figures

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

With the exception of stock changes, all values reported in the monthly natural gas questionnaire (values entered into editable cells) cannot be negative. For Deliveries to power generation this is applicable as a WARNING as this element is not mandatory for reporting to Eurostat.

Table 10		
Reported value	≥	0
Applicable as ERROR for: Indigenous production, Imports (Entries), Exports (Exits), Gross inland deliveries (Observed), Opening stock level (National territory), Closing stock level (National territory), Opening stock level (Held abroad), Closing stock level (Held abroad), Own use and losses of the natural gas industry Applicable as WARNING for: Deliveries to power generation		
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

67) Gross inland deliveries (Calculated): positive

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Gross inland deliveries (Calculated) cannot be negative.

Table 10		
Gross inland deliveries (Calculated)	≥	0
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

68) Gross inland deliveries (Calculated): formula

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The calculation formula for Gross inland deliveries (Calculated) has to be respected.

Table 10		
Gross inland deliveries (Calculated)	=	Indigenous production + Imports (Entries) - Exports (Exits) - Stock changes (National territory)
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

69) Coherence of imports

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Imports reported in Table 10 have to be equal to Total Imports reported in Table 11.

Table 10		Table 11
Imports (Entries)	=	Total Imports (Entries)
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

70) Coherence of exports

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Exports reported in Table 10 have to be equal to Total Exports reported in Table 12.

Table 10		Table 12
Exports (Entries)	=	Total Exports (Entries)
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

71) Magnitude of statistical difference

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The monthly questionnaire for natural gas also contains an element indicating the degree of difference between data from the supply side and data from the consumption side: the statistical difference. In many cases, the statistical difference can be used as an indicator to assess or look deeper in accuracy and coherence. Therefore, Eurostat looks at the evolution and the magnitude of statistical difference in reported data.

It is totally normal to have a statistical difference in the transmitted data. From a statistical perspective a difference is to be expected given that the data would be normally compiled from different sources. Actually, when the statistical difference systematically equals zero, the element of discrepancy is often hidden elsewhere as a consequence of deployed correction mechanisms (which could be questioned). In fact, a small statistical difference might indicate a more robust and more accurate system of data collections than a zero statistical difference. However, methodologies have to be evaluated on an individual level.

The ratio of statistical difference to Gross inland deliveries (Calculated) is calculated for natural gas reported in Million m^3 and in Terajoules. In general, if this ratio is higher than 5%, there is a need for explanations on national circumstances or practices. In addition Eurostat might request further information on planned national actions to review and improve data methodologies and data collection. If natural gas has a negligible importance in the national energy system, the required threshold that would trigger questions and requests for explanations may be set higher than 5%. However, if natural gas has a very high share in the national energy mix, the 5% statistical difference can also be considered as not desirable, requiring explanations and subsequent information on planned national actions to improve accuracy.

VAL_MONTHLY_COAL
$\frac{\text{abs(Statistical difference s)}}{\text{Gross inland deliveries (Calculated)}} \leq 0.05$
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)

72) Coherence of stock changes: total vs stock levels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Stock changes (National territory) have to be equal to Closing stock level (National territory) minus Opening stock level (National territory) for both, values reported in cubic metres and in terajoules.

Table 10		Table 10
Stock changes (National territory)	=	Closing stock level (National territory) - Opening stock level (National territory)
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

73) Coherence of stock changes: opening and closing

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Opening stock level have to be equal to Closing stock level of previous month

Table 10		Table 10
Current month		**Previous month**
Opening stock level (National territory)	=	Closing stock level (National territory)
Opening stock level (Held abroad)	=	Closing stock level (Held abroad)
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

74) Own use

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Reported Own use and losses of the natural gas industry should be small vis-a-vis Gross inland deliveries (Observed and Calculated). This validation rule is only warning to point out possible inconsistency in reported values.

Table 10		
Own use and losses of the natural gas	≤	0.05 × Gross inland deliveries (Calculated)
Own use and losses of the natural gas	≤	0.05 × Gross inland deliveries (Observed)
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

75) Deliveries to power generation

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Deliveries to power generation should be less or equal to the Gross inland deliveries (Observed). As reporting of "Deliveries to power generation" is not mandatory for Eurostat, this validation rule is only warning to point out inconsistency in reported values.

Table 10		
Deliveries to power generation	≤	Gross inland deliveries (Observed)
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

76) Calculated gross calorific values

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Gross calorific values calculated as the ration of reported values in TJ and reported values in Mm^3 shall be within the specific range for calorific values of natural gas.

Table 10 & Table 11 & Table 12
$30\,000 \leq \frac{\text{value in TJ}}{\text{value in Mm}^3} \times 1000 \leq 45\,000$
In Table 10 applicable for: Indigenous production, Imports (Entries), Exports (Exits), Stock changes (National territory), Gross inland deliveries (Calculated), Gross inland deliveries (Observed), Opening stock level (National territory), Closing stock level (National territory), Opening stock level (Held abroad), Closing stock level (Held abroad), Own use and losses of the natural gas industry, Deliveries to power generation, Statistical difference
In Tables 11 and 12 applicable for: all imports and exports reported

77) Of which LNG

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Imports and export reported under "of which LNG" in Table 11 and Table 12 have to be lower or equal to respective imports and exports of Natural gas in these tables.

This check is applied to each country for which imports are reported (and thus implicitly also for the Total).

Table 11 & Table 12		
Natural gas	≥	of which: LNG
Applicable to all countries (rows) and applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

78) Formula for total imports/exports

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported total imports and total export have to be the sum of all origins/destinations reported in the questionnaire (this is also ensured by the password protected locked cells in the MS Excel questionnaire template).

79) Trade of gaseous natural gas

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

For gaseous natural gas, the trade can be reported only with geographically neighbouring countries or countries with direct pipeline connection for transportation of gaseous gas.

80) Unknown origin for trade

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The quantity reported in category "Not elsewhere specified" should be in general less than 5% of total for imports (Table 11) or exports (Table 12).

Table 11 & Table 12		
Total × 0.05	≥	Non-specified/other
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

81) Self-trade

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

A country cannot report trade with itself (so, the country of origin for import cannot be the declaring country and similar for country of destination) – the reporting rules under any trade circumstance require trade to be a cross-border trade.

15. ENERGY_MOSOIL_M

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_MOSOIL_M: the monthly energy questionnaire for oil. The reporting obligation corresponds to chapter 3 in Annex C of Regulation (EC) No 1099/2008 on energy statistics.

82) No negative figures

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

With the exemption of stock changes, statistical differences and Interproduct transfers all values reported in the monthly oil questionnaire (values entered into editable cells) cannot be negative.

Table 1 & Table 2 & Table 3 & Table 4		
Reported value	≥	0
Applicable to all rows of the questionnaire (flows in Tables 1 and 2) and origins/destinations (countries in Tables 3 and 4)		
Applicable to: all products (columns) of the questionnaire		
Exceptions are reporting of Stock changes in Tables 1 and 2 and Interproduct transfers in Table 2. Also the calculated Statistical difference in Tables 1 and 2 can be negative.		

83) Backflows

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total of Backflows reported in Table 1 has to be equal to the total of Backflows to refineries reported in Table 2.

Table 1		Table 2
Total		**Total products**
Backflows	=	Backflows to refineries

84) Products transferred

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Total of Products transferred reported in Table 1 has to be equal to the total of Products transferred reported in Table 2.

Table 1		Table 2
Total		**Total products**
Products transferred	=	Products transferred

85) Coherence of imports/exports in balance table and trade table

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Imports reported in Table 1 and Table 2 are compared with total imports reported in Table 3.

Table 1 & Table 2		Table 3
Imports (balance)	=	Total Imports
all products reported in the questionnaire		

Exports reported in Table 1 and Table 2a are compared with Total exports reported in Table 5.

Table 1 & Table 2		Table 4
Exports (balance)	=	Total Exports
all products reported in the questionnaire		

86) Direct use of petroleum products

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The Total of Direct use reported in Table 1 has to be equal to the Total of Primary product receipts reported in Table 2.

Table 1		Table 2
Total		**Total products**
Direct use	=	Primary product receipts

87) Direct use of Biofuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Direct of Biofuels reported in Table 1 (Of which bBofuels) has to be equal to the sum of Primary product receipts of Biogasoline, Biodiesels and Bio jet kerosene reported in Table 2.

Table 1		Table 2
Direct use		**Primary product receipts**
Of which Biofuels	=	Biogasoline + Biodiesel + Bio jet kerosene

88) Stock changes

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Stock changes reported in Table 1 and Table 2 should correspond to the difference between Closing level of Stocks on national territory and Opening level of Stocks on national territory reported in the Table 5.

Table 1 & Table 2		Table 5
Stock changes	=	**(a) All stocks on national territory:** Closing stock level - Opening stock level
all products reported in the questionnaire		

89) Positive Refinery intake (Calculated)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

In Table 1, the Refinery intake (Calculated) cannot be negative

Table 1		
Refinery intake (Calculated)	≥	0
all products reported in the questionnaire		

90) Positive Gross inland deliveries (Calculated)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

In Table 2, the Gross inland deliveries (Calculated) cannot be negative

Table 2		
Gross inland deliveries (Calculated)	≥	0
all products reported in the questionnaire		

91) Refinery losses

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The Total of Memo items: Refinery losses reported in Table 1 have to correspond to the difference between the Total Refinery intake (Observed) reported in Table 1 and the Total Refinery gross output reported in Table 2.

Table 1		Table 2
Total		**Total products**
Refinery intake (Observed) – Memo items: Refinery losses	=	Refinery gross output

92) Interproduct transfers

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The Total of Interproduct transfers reported in Table 2 has to be equal to zero.

Table 2		
Total products		
Interproduct transfers	=	0
applicable only for TOTAL		

93) Disaggregated Gross inland deliveries (Observed)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The total of detailed items specifying use of products in the economy cannot be bigger than the observed inland deliveries of such products.

Table 2		Table 2
Total		**Total products**
Deliveries to international aviation + Deliveries to main activity producer power plants + Deliveries of automotive LPG + Deliveries of rail and marine diesel	≤	Gross inland deliveries (Observed)
all products reported in the questionnaire		

94) Positive Gross inland deliveries (Calculated)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

In Table 2, the Net deliveries of Total products cannot be negative.

Table 2		
Total products		
Net deliveries of Total products	≥	0

95) Gross inland deliveries (Primary products)

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

For Crude oil and Natural gas liquids, in Table 2 Gross inland deliveries calculated has to be equal to the observed Gross inland deliveries (Observed) reported in Table 2.

Table 2		
Only for Crude Oil & Natural gas liquids		
Gross Inland Deliveries (Calculated)	=	Gross Inland Deliveries (Observed)

96) Efficiencies of oil refineries

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

Refinery gross output of finished products reported in Table 2 is divided by Total Refinery intake observed reported in Table 1 to obtain the efficiency of oil refineries. This efficiency should be between 90% and 100%.

Table 1		Table 2
Total		**Total products**
Refinery intake observed		Refinery gross output
$0.9 \leq \frac{\text{Refinery gross output}}{\text{Refinery intake observed}} \leq 1$		
Applicable only for the Totals of all products on Table 1 and Table 2		

97) Blended biofuels

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

All values reported for Total motor gasoline in all tables has to be equal to the sum of the values reported for Biogasoline and Non biogasoline in the same tables.

All values reported for Total kerosene type jet fuel in all tables has to be equal to the sum of the values reported for Bio jet kerosene and Non-bio jet kerosene in the same tables.

All values reported for Total gas/diesel oil in all tables (sheet Gas-Diesel Oil) has to be equal to the sum of the values reported in the same tables for Biodiesel and Non-bio gas/diesel oil..

Under normal circumstances, the respective totals of blended fuels are defined in the locked cells of the MS Excel questionnaire and thus implicitly respected and ensured.

All Tables in the questionnaire		
Total motor gasoline, Biogasoline, Non biogasoline, Kerosene type jet fuel, Bio jet kerosene, Non-bio jet kerosene, Gas-Diesel Oil, Biodiesel, Non-bio gasdiesel oil		
Total motor gasoline	=	Biogasoline + Non biogasoline
Kerosene type jet fuel	=	Bio jet kerosene + Non-bio jet kerosene
Gas-Diesel Oil	=	Biodiesel + Non-bio gasdiesel oil

98) Total Fuel oil

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

All values reported for Total fuel oil in all tables has to be equal to the sum of the values reported for Fuel oil low sulphur and Fuel oil high sulphur in the same. Under normal circumstances, the respective totals of blended fuels are defined in the locked cells of the MS Excel questionnaire and thus implicitly respected and ensured.

All Tables in the questionnaire		
Total fuel oil, Fuel oil - low sulphur, Fuel oil - high sulphur		
Total fuel oil	=	Fuel oil low sulphur + Fuel oil high sulphur

99) Statistical difference

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The monthly energy questionnaire for oil also contains an element indicating the degree of difference between data from the supply side and data from the consumption side: the statistical difference. In many cases, the statistical difference can be used as an indicator to assess or look deeper in accuracy and coherence. Therefore, Eurostat looks at the evolution and the magnitude of statistical difference in reported data.

It is totally normal to have a statistical difference in the transmitted data. From a statistical perspective a difference is to be expected given that the data would be normally compiled from different sources. Actually, when the statistical difference systematically equals zero, the element of discrepancy is often hidden elsewhere as a consequence of deployed correction mechanisms (which could be questioned). In fact, a small statistical difference might indicate a more robust and more accurate system of data collections than a zero statistical difference. However, methodologies have to be evaluated on an individual level.

In the monthly energy questionnaire for oil the statistical differences appear in two places: in Table 1 and in Table 2. The ratio of statistical difference to supply is calculated. In general, if this ratio is higher than 5%, there might be a need for explanations on national circumstances or practices. In addition Eurostat might request further information on planned national actions to review and improve data methodologies and data collection. For products having a negligible importance in the national energy system, the required threshold that would trigger questions and requests for explanations may be set higher than 5%. For energy products with a very high share in the national energy mix, the 5% statistical difference can also be considered as not desirable, requiring explanations and subsequent information on planned national actions to improve accuracy.

Table 1
$\frac{\text{abs(Statistical difference s)}}{\text{max(Indigenous production , Refinery intake Calculated)}} \leq 0.05$
Applicable to: all products in Table 1

Table 2
$\frac{\text{abs(Statistical differences)}}{\text{Gross inland deliveries Calculated}} \leq 0.05$
Applicable to: all products in Table 2

100) Unknown origin for trade

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The quantity reported in category "Not elsewhere specified" should be in general less than 5% of total for imports (Table 11) or exports (Table 12).

Table 3 & Table 4		
Total × 0.05	≥	Non-specified/Other
Applicable to: all products in Table 3 & Table 4		

101) Self-trade

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

A country cannot report trade with itself (so, the country of origin for import cannot be the declaring country and similar for country of destination) – the reporting rules under any trade circumstance require trade to be a cross-border trade

102) Coherence of stock changes: opening and closing

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Opening stock level have to be equal to Closing stock level of previous month

Table 5, Table 5b_5c		
Current month		**Previous month**
Opening stock levels	=	Closing stock levels
Opening stock levels	=	Closing stock levels
Applicable for all types of stocks reported in the questionnaire		

103) Coherence of Table 5 with other Tables

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

There has to be coherence in the statistical information reported in Table 5 with other tables in the questionnaire.

Table 1		**Table 5**
Stock changes	=	Closing – Opening
For All stocks on national territory		
Applicable only for all products in Table 1		

Table 2		**Table 5**
Stock changes	=	Closing – Opening
For All stocks on national territory		
Applicable only for all products in Table 2		

Table 6		**Table 5**
Total & Total products		**Total & Total products**
Closing stock levels	=	Closing stock levels
For Stocks held for other countries under official agreement		

Table 7		**Table 5**
Total & Total products		**Total & Total products**
Closing stock levels	=	Closing stock levels
For Stocks with known foreign destination		

Table 8		**Table 5**
Total & Total products		**Total & Total products**
Closing stock levels	=	Closing stock levels
For Stocks held abroad under official agreement		

Table 9		**Table 5**
Total & Total products		**Total & Total products**
Closing stock levels	=	Closing stock levels
For Stocks held abroad designated definitely for import into your country		

104) Coherence of "Of which" tables

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

Information provided in Table 6 and in Table 8 is further specified for its certain subcategories in Tables 6b and Tables 8b and 8c respectively. There has to be coherence in the statistical information reported – the values in the subcategories (of which) in Tables 6b, 8b and 8c has to be lower than the values in the superposition table.

for all reported values		
Table 6b	≤	Table 6
Table 8b	≤	Table 8
Table 8c	≤	Table 8

16. ENERGY_SOLID_M

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_SOLID_M: the monthly energy questionnaire for coal. The reporting obligation corresponds to chapter 1 in Annex C of Regulation (EC) No 1099/2008 on energy statistics.

105) No negative figures

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

With the exemption of stock changes for peat, all values reported in the monthly coal questionnaire (values entered into editable cells) cannot be negative.

VAL_MONTHLY_COAL		
Reported value	≥	0
Applicable to Production, Recovered products, Total imports, of which from outside EU, Total exports, Stocks - beginning of period, Stocks - end of period, Internal market deliveries (observed), Deliveries to main activity producers, Deliveries to coking plants, Deliveries to total industry, of which to iron and steel industry, Other deliveries (services, households, …)		
Applicable to: Hard coal, Brown coal, Peat, Oil shale and oil sands, Coke oven coke		

106) Total imports

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported Total imports cannot be smaller than its subcategory "out of which from outside EU".

VAL_MONTHLY_COAL		
Total imports	≥	out of which from outside EU
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for "out of which from outside EU" is highlighted in red.		

107) Stock changes

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported "Stock changes" shall be equal to the difference between "Stocks - beginning of period" and "Stocks - end of period". This is not applicable for Peat, where beginning of period and end of period stocks are not reported.

VAL_MONTHLY_COAL		
Stock changes	=	"Stocks - beginning of period" - "Stocks - end of period"
In the MS Excel questionnaire this is implemented as a formula in a locked cell.		
Applicable to: Hard coal, Brown coal, Oil shale and oil sands, Coke oven coke		

108) Calculated inland deliveries: sum

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The Calculated inland deliveries have to respect its definition: Production + Recovered products + Total imports - Total exports + Stock changes.

VAL_MONTHLY_COAL		
Calculated inland deliveries	=	Production + Recovered products + Total imports - Total exports + Stock changes
In the MS Excel questionnaire this is implemented as a formula in a locked cell.		
Applicable to: Hard coal, Brown coal, Peat, Oil shale and oil sands, Coke oven coke		

109) Calculated inland deliveries: positive

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The Calculated inland deliveries cannot be negative.

VAL_MONTHLY_COAL		
Calculated inland deliveries	≥	0
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for "Calculated inland deliveries" is highlighted in red.		
Applicable to: Hard coal, Brown coal, Peat, Oil shale and oil sands, Coke oven coke		

110) Disaggregated consumption of hard coal

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1
Processing stage: B

For Hard coal only, the "Internal market deliveries (observed)" and "Statistical differences" have to respect its definition.

VAL_MONTHLY_COAL		
Internal market deliveries (observed)	=	Deliveries to main activity producers + Deliveries to coking plants + Deliveries to total industry + Other deliveries (services, households, …)
Statistical differences	=	Calculated inland deliveries - Internal market deliveries (observed)
In the MS Excel questionnaire this is implemented as a formula in a locked cell.		
Applicable to: Hard coal		

111) Magnitude of statistical difference

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1
Processing stage: B

For Hard coal, the monthly energy questionnaire also contains an element indicating the degree of difference between data from the supply side and data from the consumption side: the statistical difference. In many cases, the statistical difference can be used as an indicator to assess or look deeper in accuracy and coherence. Therefore, Eurostat looks at the evolution and the magnitude of statistical difference in reported data.

It is totally normal to have a statistical difference in the transmitted data. From a statistical perspective a difference is to be expected given that the data would be normally compiled from different sources. Actually, when the statistical difference systematically equals zero, the element of discrepancy is often hidden elsewhere as a consequence of deployed correction mechanisms (which could be questioned). In fact, a small statistical difference might indicate a more robust and more accurate system of data collections than a zero statistical difference. However, methodologies have to be evaluated on an individual level.

The ratio of statistical difference to Calculated inland deliveries is calculated for hard coal. In general, if this ratio is higher than 5%, there is a need for explanations on national circumstances or practices. In addition Eurostat might request further information on planned national actions to review and improve data methodologies and data collection. If Hard coal has a negligible importance in the national energy system, the required threshold that would trigger questions and requests for explanations may be set higher than 5%. However, if Hard coal has a very high share in the national energy mix, the 5% statistical difference can also be considered as not desirable, requiring explanations and subsequent information on planned national actions to improve accuracy.

VAL_MONTHLY_COAL
$\frac{\text{abs(Statistical differences)}}{\text{Calculated inland deliveries}} \leq 0.05$
Applicable to: Hard coal

112) Deliveries to total industry

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reported Deliveries to total industry cannot be smaller than its subcategory "of which to iron and steel industry".

VAL_MONTHLY_COAL		
Deliveries to total industry	≥	of which to iron and steel industry
In the MS Excel questionnaire this is implemented via conditional formatting – in case of an error the cell for "of which to iron and steel industry" is highlighted in red.		
Applicable to: Hard coal		

17. Validating the full monthly collection

The previous chapters described the validation of the individual data files (individual transmissions of the questionnaires). This chapter describe the cross validation (relationships) between the various transmitted questionnaires from one country. Several combinations of data points reported in various places are checked for accuracy, comparability and coherence (elements b, f, and g of Article 6(3) in Regulation (EC) No 1099/2008 on energy statistics).

Validation at this stage can be performed only at later moment of time, as it requires availability of all data transmissions from one country.

113) Consistency between monthly energy statistics and annual energy statistics

Validation type: **WARNING**

Inclusion in error convention: NO
Validation level: 2
Processing stage: D

Theses checks are done in order to ensure the consistency of the data between the annual energy statistics (Annex B of the Regulation) and monthly energy statistics (sum of 12 months representing the calendar year – Annex C of the Regulation).

While the sum of monthly data representing calendar year is not expected to align perfectly with annual data with no discrepancy, the observed discrepancy should be relatively low. High discrepancies indicate possible flaws in the statistical methodologies for compilation of monthly[3] data.

On the other hand, perfect alignment can also be an artefact of a methodological approach. Either the annual energy statistics can be compiled as sum of 12 calendar months from the monthly energy statistics or monthly energy statistics can be retrospectively revised when annual energy statistics is available. In fact, a small magnitude of discrepancies between monthly and annual data might indicate a more robust and more accurate system of data collections than a perfect alignment. However, methodologies have to be evaluated on an individual level.

The subsequent tables show some examples of elements that can be compared between monthly and annual data – the list of examples is only illustrative and not exhaustive:

Oil		
sum of 12 months		**annual data**
Table 1		**Table 1**
Indigenous production	⇔	Indigenous production
Receipts from other sources	⇔	Receipts from other sources
Backflows	⇔	Backflows
Products transferred	⇔	Products transferred
Imports (Balance)	⇔	Imports (Balance)
Exports (Balance)	⇔	Exports (Balance)
Direct use	⇔	Direct use
Stock changes	⇔	Stock changes
Refinery intake (Calculated)	⇔	Refinery intake (Calculated)
Refinery intake (Observed)	⇔	Refinery intake (Observed)
Applicable for reporting of Crude oil, Natural gas liquids, Refinery feedstocks, Additives/oxygenates, Of which Biofuels, Other hydrocarbons and the Total		

[3] Eurostat assumes that annual energy statistics is of higher accuracy than monthly energy statistics.

Oil		
sum of 12 months		**annual data**
Table 2		**Table 2a**
Primary product receipts	⇔	Primary product receipts
Refinery gross output	⇔	Refinery gross output
Recycled products	⇔	Recycled products
Refinery fuel	⇔	Refinery fuel
Imports (Balance)	⇔	Imports (Balance)
Exports (Balance)	⇔	Exports (Balance)
International marine bunkers	⇔	International marine bunkers
Interproduct transfers	⇔	Interproduct transfers
Products transferred	⇔	Products transferred
Stock changes	⇔	Stock changes
Gross inland deliveries (Calculated)	⇔	Gross inland deliveries (Calculated)
Table 2		**Table 2b**
Gross deliveries to the petrochemical industry	⇔	Gross deliveries to the petrochemical industry
Backflows to refineries	⇔	Backflows to refineries
Net deliveries of Total products	⇔	Net deliveries of total products
Applicable for reporting of Crude oil, Natural gas Liquids, Refinery gas, Ethane, LPG, Naphtha, Total motor gasoline, Biogasoline, Non-biogasoline, Aviation gasoline, Gasoline type jet fuel, Total kerosene type jet fuel, Bio jet kerosene, Non-bio jet kerosene, Other kerosene, Total gas/diesel oil, Biodiesels, Non-bio gas/diesel oil, Total fuel oil, Fuel oil-low sulphur (<1%), Fuel oil-high sulphur (>=1%), Petroleum coke and the Total		

Oil		
sum of 12 months		**annual data**
Table 3: IMPORTS BY ORIGIN	⇔	**TABLE = 4 IMPORTS BY ORIGIN**
Table 4: EXPORTS BY DESTINATION	⇔	**TABLE = 5 EXPORTS BY DESTINATION**
Applicable for reporting of Crude oil, Natural gas Liquids, Refinery gas, Ethane, LPG, Naphtha, Total motor gasoline, Biogasoline, Non-biogasoline, Aviation gasoline, Gasoline type jet fuel, Total kerosene type jet fuel, Bio jet kerosene, Non-bio jet kerosene, Other kerosene, Total gas/diesel oil, Biodiesels, Non-bio gas/diesel oil, Total fuel oil, Fuel oil-low sulphur (<1%), Fuel oil-high sulphur (>=1%), Petroleum coke and the Total		
Applicable for origins/destinations (countries) that exists in the monthly questionnaire and also in the annual questionnaire.		

Natural gas		
sum of 12 months		**annual data**
Table 10: SUPPLY OF NATURAL GAS		**Table 1: SUPPLY OF NATURAL GAS**
Indigenous production	⇔	Indigenous production
Imports (Entries) - Exports (Exits)	⇔	Imports (Balance) - Exports (Balance)
Stock changes (National territory)	⇔	Stock changes (National territory)
Applicable for reporting of natural gas in Million m^3 (15°C, 760 mm Hg) and reporting of natural gas in Terajoules (Gross calor. value)		

Electricity		
sum of 12 months		**annual data**
Table 1		**Table 2 – TOTAL ELECTRICITY**
Total net production	⇔	Electricity
Nuclear	⇔	Nuclear
Conventional thermal	⇔	Combustible fuels
Hydro	⇔	Hydro
Wind	⇔	Wind
Solar	⇔	Solar
Geothermal	⇔	Geothermal
Table 2	⇔	**Table 3 - ELECTRICITY**
Total net production	⇔	Total net production
Total imports	⇔	Total imports (balance)
Total exports	⇔	Total exports (balance)
Used for pumped storage	⇔	Used for pumped storage
Transmission and distribution losses	⇔	Distribution losses
Total consumption (calculated)	⇔	Final consumption (calculated)

Coal		
sum of 12 months		**annual data – Table 1**
Production	⇔	Indigenous production
Recovered products	⇔	From other sources
Total imports	⇔	Total imports (Balance)
Total exports	⇔	Total exports (Balance)
Stock changes	⇔	Stock changes (National territory)
Calculated inland deliveries	⇔	Inland consumption (Calculated)
Deliveries to main activity producers	⇔	Main activity producer electricity plants + Main activity producer CHP plants + Main activity producer heat plants
Deliveries to coking plants	⇔	Coke ovens (Transformation) + Coke ovens (Energy)
Applicable to the following products		
Hard coal	⇔	Anthracite + Coking coal + Other bituminous coal
Brown coal	⇔	Sub-bituminous coal + Lignite
Peat	⇔	Peat
Oil shale and oil sands	⇔	Oil shale and oil sands
Coke oven coke	⇔	Coke oven coke

18. Energy prices

114) Magnitude order for price levels

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

In general, taxes or VAT cannot be negative, the reported price at each level have to respect hierarchical order in magnitude Level 1 price have to be the lower or equal to Level 2 price and Level 2 price have to be the lower or equal to Level 3 price.

Table 1		
Level 2	≥	Level 1
Level 3	≥	Level 2

115) No negative figures

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The reported prices, taxes, levies and charges as well as the relative portions in the tables of the questionnaires for reporting prices of natural gas and electricity are in general positive figures. Every negative figure that is reported needs special attention during data validation.

All tables		
All questionnaires		
Reported value	≥	0
All bands		

Specific 2nd semester validation

This chapter describes additional validation rules applicable to natural gas and electricity prices questionnaires for 2nd semester – in this semester reporting of detailed disaggregated data is mandatory. For each rule it is indicated to which datasets it applies. All validation rules apply to all respective consumption bands.

- ENERGY_PR**ELH**_S (Electricity prices for household customers)
- ENERGY_PR**ELI**_S (Electricity prices for non-household customers)
- ENERGY_PR**GAH**_S (Natural gas prices for household customers)
- ENERGY_PR**GAI**_S (Natural gas prices for non-household customers)

116) Disaggregated Level 1 price

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The Level 1 price reported in Table 1 has to be equal to the sum of "Energy and supply" and "Network costs" reported in Table 2.

Table 1		Table 2
Level 1	≈	"Energy and supply" + "Network costs"
arithmetic average of semestrial data		annual data
ELH, ELI, GAH, GAI		

117) Disaggregated Level 3 prices

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The difference between Level 3 and Level 1 prices reported in Table 1 has to be equal to "Total" for "Taxes, fees, levies and charges" reported in Table 2.

Table 1		Table 2
Level 3 – Level 1	≈	Total
arithmetic average of semestrial data		annual data
ELH, ELI, GAH, GAI		

118) Disaggregated taxes: error

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The sum of different reported taxes, fees, levies and charges in Table 2 cannot be bigger than reported Total in Table 2. Due to possible non-available data points, exact equal sign is not requested for this validation rule.

Table 2		Table 2
Value Added Tax + Promotion of renewable taxes + Capacity taxes + Environmental taxes + Nuclear taxes + All other taxes, fees, levies and charges	≤	Total
ELH, ELI		

Table 2		Table 2
Value Added Tax + Promotion of renewable taxes + Capacity taxes + Environmental taxes + All other taxes, fees, levies and charges	≤	Total
GAH, GAI		

119) Disaggregated taxes: warning

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 1

Processing stage: B

The sum of different reported taxes, fees, levies and charges in Table 2 should in general be equal to the reported Total in Table 2. Due to possible non-available data points, this validation rule is only a warning.

Table 2		Table 2
Value Added Tax + Promotion of renewable taxes + Capacity taxes + Environmental taxes + Nuclear taxes + All other taxes, fees, levies and charges	=	Total
ELH, ELI		

Table 2		Table 2
Value Added Tax + Promotion of renewable taxes + Capacity taxes + Environmental taxes + All other taxes, fees, levies and charges	=	Total
GAH, GAI		

120) Disaggregated network costs

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The reporting of disaggregation of network cost between the transmission costs portion and distributions costs portion has to add up to 100% within a small rounding margin.

Table 4
99% ≤ Transmission costs (%) + Distribution costs (%) ≤ 101%
ELH, ELI, GAH, GAI

121) Consumption volumes

Validation type: **ERROR**

Inclusion in error convention: YES

Validation level: 1

Processing stage: B

The sum of portion of individual consumption volumes for each band has to add up to 100% within a small rounding margin.

Table 4
$99\% \leq \sum_{\text{bands}} (\text{consumption volumes}) \leq 101\%$
ELH, ELI, GAH, GAI

19. Validation level 3: Cross country validation

The previous chapters described the validation of the individual data transmissions and their combinations, however always within transmissions from one country – in other words ESS.VIP validation levels 1 and 2 have been covered. In this chapter, the validation of received transmissions across countries (validation level 3) will be described.

Validation at this stage can be performed only at later moment of time, as it requires availability of all data transmissions from all reporting countries – validation rules can be completely performed only when all data transmissions from all reporting countries have arrived to Eurostat.

Elements of validation described in this chapter do not allow for an immediate correction of the data but indicate the need for a deeper investigation in order to determine the problem that needs to be solved in the long(er) term. In practical terms, these assessments are usually performed outside the peak period of data processing and after the data have been published.

122) Trade mirroring check

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 3

Processing stage: F

The aim of this validation step is to ensure that there is a consistency between imports and exports declared by various countries. For example, Country XYZ reported exports to Country ABC, then Country ABC should report imports from Country XYZ. This validation is performed for all traded fuels reported. It applies to the following datasets in EDAMIS:

- ENERGY_ELECT_A (annual questionnaire for electricity & heat)
- ENERGY_NTGAS_A (annual questionnaire for natural gas)
- ENERGY_PETRO_A (annual questionnaire for oil)
- ENERGY_RENEW_A (annual questionnaire for renewables & waste)
- ENERGY_SOLID_A (annual questionnaire for coal)
- ENERGY_MOSGAS_M (monthly questionnaire for natural gas)
- ENERGY_MOSOIL_M (monthly questionnaire for oil)

In general, there are two main categories of results for these checks:

- the partner country is missing (i.e. one of the countries of import/export declares nothing, while the counter-partner has declared a quantity which was exported/imported from its partner)
- there are discrepancies (smaller or higher) between the counter-partners

Mathematically, the difference takes the form of a zero or non-zero figures in the reported values for the same trade by different countries. Eurostat undertakes mirror checks in both absolute and relative terms, if at least one of the reporting countries declares a trade (import or export) with another country.

In absolute terms, a simple subtraction of corresponding values reported by each country is carried out. In ideal case, the resultant value is close to zero. If too many discrepancies are detected, those

with the larger absolute magnitude (higher positive values or lower negative values) are investigated first.

In relative terms, the resulting value is a percentage. In order to avoid division by zero errors and also to ensure the same percentage discrepancy from both sides of the trading partners, the following formula is used for calculating the validation percentage:

$$\% = 100 \times \mathrm{ABS}\left(\frac{\mathrm{CountryXYZ} - \mathrm{CountryABC}}{\left(\frac{\mathrm{CountryXYZ} + \mathrm{CountryABC}}{2}\right)}\right)$$

In the ideal case, this value is close to zero. If too many discrepancies are detected, those with the larger relative validation percentage are investigated first.

Those combinations of high absolute value discrepancy and high relative discrepancy are given the highest priority.

Eurostat executes these trade mirroring checks only for trade between European countries that report data to Eurostat. For practical operational purposes, Eurostat has established the following thresholds for absolute discrepancies. Below these thresholds trade discrepancies between reporting countries are not further questioned and analysed. Since there are expectations on improvement in data accuracy, these thresholds will progressively be narrowed over time.

Product/Fuel	Absolute trade discrepancy validation threshold
Reporting cycles 2017-2021	
Primary and derived coal products	100 kt
Crude oil and petroleum products	100 kt
Natural gas	10 000 TJ and 300 Mm^3
Electricity	1 000 GWh

In case discrepancies above the thresholds are detected, reports will be sent to both reporting countries in order to solve the discrepancy with their counter-partners.

123) Calorific values

Validation type: **WARNING**

Inclusion in error convention: NO

Validation level: 3

Processing stage: F

The liberalised energy market and its globalised nature have resulted in many consequences. While there is a huge variety of products on the market, the free movement of energy users across countries results in demand for products of standardised qualities. For example drivers of vehicles buy fuels abroad during their trips as the vehicle fuel specifications are often highly harmonised within large geographical regions. Consequently, the calorific values of certain products should follow similar trends and consequently in a similar range of values reported by different countries in a particular region.

Calorific values can be checked for trade of coal. Depending on traded quantities, the calorific values reported by producers for the export of coal and the calorific values reported by the importing country should be comparable. This is naturally influenced by the mix of different suppliers delivering to a country, but depending on specific circumstances, such checks are often feasible. This check can be performed only in case where trade data and their calorific values are reported and at the same time available for both the producer (ultimate origin) and the user (final destination).

These examples indicate that this methodological basis should allow Eurostat to compare some calorific values reported by countries with the calorific values reported by other countries. These checks cannot be carried out for all energy fuels, but only for those where there are fundamental arguments justifying such behaviour of calorific values.

In those cases where diverging trends or outliers are detected, the reporting countries will be requested to provide further explanations and clarifications.

ANNEX

ENERGY_SHARES_A

This chapter describes validation rules for the data transmission in EDAMIS dataset ENERGY_SHARES_A: the SHARES tool, which is aimed at calculating the share of energy from renewable sources according to Directive 2009/28/EC on the promotion of the use of energy from renewable sources. It uses validated data from the 5 annual energy questionnaires: ENERGY_ELECT_A, ENERGY_NTGAS_A, ENERGY_PETRO_A, ENERGY_RENEW_A, ENERGY_SOLID_A.

Inclusion in error convention: NO

124) Sheet: TRANSPORT

- The total amount of compliant (sustainable) biofuels is less or equal to the total amount of biofuels (compliant + non-compliant).
- The total amount of biofuels calculated with Annex III calorific values is very similar (but not equal) to the total amount of biofuels imported from the annual questionnaires (calculated with real CV).
- Electricity used to produce non-biological renewable transport fuels is reported if hydrogen or synthetic fuels of renewable origin are reported.
- Plausibility of all time series (including reasonable/justified variations across years, break in series, etc.).

125) Sheet: OVERALL TARGET

- For electricity, heating and cooling or derived heat production: The total amount of compliant (sustainable) bioliquids is less or equal to the total amount of bioliquids (compliant + non-compliant).
- Plausibility of all time series (including reasonable/justified variations across years, break in series, etc.).

126) Sheet: HEAT PUMPS

- Plausibility of time series (including reasonable/justified variations across years, break in series, etc.).
- Consistency of the climate zones in which heat pumps are reported with the map of climatic areas in the SHARES Tool Manual.

127) Sheet: STAT. TRANSFERS

- Verification across countries. Consistency of the information provided by partner countries in cooperation mechanisms. If available, this information is cross-checked with the bilateral agreements signed at Government level.

128) Sheet: GAS

- The amount of biogas injected in the natural gas grid to be consumed in transport with traceability requirements cannot exceed the total amount of biogas injected in the natural gas grid (as reported in the natural gas questionnaire under "Memo: Receipts from other sources – Renewables).
- The amount of biogas injected in the natural gas grid to be consumed in transport with traceability requirements cannot exceed the total amount of methane (of all forms) consumed in transport (as reported in the natural gas questionnaire under "Total final consumption – Transport sector – Road").

129) Sheet: REN

- Generation without pumping in mixed hydro plants should reported (unless duly justified) when the country reports mixed hydro production.
- Plausibility of time series for generation without pumping (including reasonable/justified variations across years, break in series, etc.).

130) Sheet: OVERALL SUMMARY

- Plausibility of all time series (including reasonable/justified variations across years, break in series, etc.).